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The Editor's notes are marked (Ed.).

FIRST PART

ORIGINAL ARTICLES

Reconstitution of Portuguese Vineyards by means of American Stocks.

by

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The cultivation of the vine is still one of the most important and characteristic branches of agriculture in Portugal. Vines are cultivated in every part of the country from the dunes of the coast up to 1 600 ft. above sea level. They occupy an area of about 773 000 acres, and, either gathered in great numbers in contiguous belts or scattered among other crops, they extend over a great part of the whole Portuguese slope which gradually sinks in a south-easterly direction from a height of 6 500 ft. down to the level of the Atlantic. The Portuguese vineyards produce upwards of 154 000 000 gallons of wine, among which are some of the most famous wines of the world: Port, Madeira (1), Muscat of Setubal and *orçavelles*, besides some excellent table wines such as *Collares*, *Bucellos* and *Daô*, and great quantities of wines for blending purposes. The early produce of the Portuguese vineyards is worth upwards of 20 000 000 escudos (about £4 000 000); it pays 30 000 000 days' work to the vineyard hands and provides the export trade with nearly 22 000 000 gallons of wines of all qualities worth about 8 000 000 escudos (about £1 600 000). This great national asset, now the same that it was before the invasion of phylloxera, has been reconstituted in the period of about 15 years of systematic and effective fighting against the pest, not including the period of the first feeble and hesitating efforts at the commencement of the invasion.

Phylloxera was introduced into Portugal about 1872 by some French stocks planted in a vineyard of *Douro*, the district which produces that wine.

At first the invasion was slight and not alarming. The surface of the region being very broken and not having much intercourse with the other wine-growing districts, the pest remained for a fairly long time limited to the Douro region.

(1) In the Island of Madeira.

(Author's note).

Owing to the indifference with which the vine growers considered the new disease, the State agricultural officials encountered serious difficulties in their first attempts to control it. Up to 1886 the struggle against phylloxera was inefficient and desultory; in some districts the farmers would not believe in a possible destruction of their vineyards and by their incredulity favoured the spread of the pest, carelessly importing infected cuttings and plants and allowing them to circulate freely in the country.

The means of control employed in Portugal were the same as those used everywhere else. Sulphide of carbon was used at first in all treatments, both curative and destructive. On a lesser scale potassium sulpho-carbonate was also used. Several farmers had recourse to flooding, but this process was applied to a limited area, barely reaching 5 000 acres.

To a greater extent planting in sandy soils was practised, and there are still some important vineyards on the sands of the coast and of the interior. The most extensive vineyard of Portugal and of the whole world, belonging to the great agriculturist José Maria des Santos is, for the greatest part of its considerable area — 11 115 acres — situated on sandy soils, and consists of ungrafted vines. This vineyard, which extends along a railway, affords a good demonstration of the efficaciousness of planting on sandy soils. The breaking up of the land before planting the vines, which was done by steam, caused a clayey subsoil to crop up in places near the middle of the vineyard. The first plantation having consisted entirely of ungrafted stocks, the vines planted on the clayey spots died of phylloxera in a short time, thus affording all those who travelled by that railway a convincing demonstration of the resistance to phylloxera of sandy soils, on which the great extent of the green foliage of the vines was barely spotted by the dead vines of the clay patches. This spectacle, however, did not last long because the vines on the clay spots were replaced by American stocks. The land, but slightly undulated, is constituted by very mobile tertiary lands, sometimes quick sands, resting on a clay subsoil over which there is a film of water, which, as is well known, still further increases the resistance of sand against the spreading of phylloxera.

Nevertheless the greatest aids to the reconstitution of the Portuguese vineyards were the American stocks upon which they are almost exclusively based.

In fact if the above mentioned plantations be excepted, namely those *ungrafted* ones that are protected by *flooding* or by their situation on *sandy* soils, it is difficult to find vineyards that are not completely infested by phylloxera in Algarve, the most southern province of the country, from the rest of which it is separated by a mountain range averaging about 2 000 ft. in height, and in the most northern province, Minho, where the vines being trained high resist longer, as is well known, the destructive action of the insect. All this however does not make up an area much above 197 000 acres actually under vines.

The first attempts at reconstituting with American stocks were not successful.

In 1880, M. Laliman, who played an important part in the reconstitution of the French vineyards, delivered a lecture at the Central Society of Agriculture of Portugal and found his audience incredulous and hostile to American stocks.

The want of success which attended the first attempts with American stocks is explained by the scanty knowledge the experimenters possessed of these vines, of the conditions required for their *adaptation* to the various soils, and of their affinity to the varieties of the country. To these reasons must be added the careless use of non-selected stocks and the want of skill in grafting.

The non-selected *Jacquez*, York Madeira, Herbemont, Taylor, and Solonis vines caused the failure of several plantations.

It was only later, towards 1888, when some reconstitutions on a grand scale had succeeded, that the reconstitution movement began to develop.

Already in 1895 the fears of a probable excess of production caused a congress of vine growers to be held at Lisbon! When confidence was established, Portuguese vine-growers, by their initiative, diligence and outlay of capital, gave a great example of energy and of their capacity to act intelligently and rapidly.

With the exception of some errors of *adaptation* and the want of scruples of some nurserymen, it may be said that the reconstitution was perfect and its results excellent.

The present Portuguese vineyards are grafted on the American stocks *Riparia* and *Rupestris* and on some hybrids of *Aramon Rupestris* (Gansin), *Riparia* × *Rupestris* No. 3306 and 3309 (Coudère) and No. 101-14 of Millardet.

By far the greater number of Portuguese vineyards include almost exclusively the pure species *Riparia* and *Rupestris* in their various forms; *Riparias* are especially represented by *Riparia gloire de Montpellier* in loamy soils, and the *Rupestris* by *Rupestris monticola* in heavy clay soils, and by *Rupestris Martin* on the stony and dry hillsides. Some vineyards in moist soils are grafted on *Solonis* and *Solonis* × *Riparia*. Nevertheless the results yielded by *Solonis* were very uncertain, according to the forms employed, and some plantations of *Solonis* in full vegetation were to be seen by the side of others showing but little vigour, while others again were already dead, according to the greater or lesser honesty of the nurserymen.

The reconstitution on calcareous soils is not a problem of very great importance in Portugal, as soils containing much lime or rich in limestone in a state of minute division occupy a very limited area. Soils with more than 10 per cent of limestone are rare.

Nevertheless on some of these soils *Berlandieri* and its hybrids with *Vinifera* have been employed. More frequently though, *Aramon* × *Rupestris* No. 1 of Gansin and *Rupestris Monticola*, which possess sufficient resistance for most cases, are to be met with.

American vines as direct producers of grapes have been tried, but only as curiosities. In the Azores some Isabella vines, a variety of *La brusca* whose grapes have a foxy taste, are still kept. On the mainland this kind is considered only as ornamental.

The adoption of American vines modified profoundly the cultivation of the vine in Portugal.

The first effect has been to change the situation of the vineyards which formerly were located on the hill slopes in dry and poor soils. Now the vineyards have descended to the plains or kept to the slightly sloping ground where the soil is deep.

Some of the most fertile plains of the country, like that of Ribatejo have been planted to vines on a great scale. Besides the greater need of American vines as regards depth of soil and the depth to which the latter has to be broken up, the change in economical conditions has favoured this displacement of the Portuguese vineyards, which at first lost something in the quality of their produce but gained much in intensity of production.

Grafting, which was rendered necessary by the use of American stocks, contributed also to the increase of production, and by requiring greater care to be taken in the cultivation of the vine brought about a great improvement in cultural methods. The graft most used was cleft-grafting and frequently also whip-grafting in plantations made with American cuttings; inarching was used only in nurseries.

From the preliminary breaking up of the soil up to the vintage it may be said that all operations connected with the vines have been influenced by the introduction of American stocks. The soil was worked to a greater depth and more thoroughly. Preparatory and cultural improvements, which formerly were comparatively rare, became common practices. The use of artificial fertilizers, nitrogenous, phosphatic and even potassic notwithstanding the fact that Portuguese soils are frequently rich in potash, became general.

The vines were planted further apart, and instead of being placed always in rows or squares, they were planted to a great extent in quadrangles. The average distance between the vines, formerly 3 ft. 3 in. 4 ft. 9 in., has often been increased to 6 ft. 6 in.

Hoeing has become a current practice.

The system of pruning the canes known as Guyot's, though it is of Portuguese origin and has been practised from remote periods in the Douro region, has become general throughout the country; the old system of pruning is still followed in the great vineyards of Ribatejo and in the plains, with the only object of saving expense.

As for the vintage, more care than formerly is bestowed on fixing the time of gathering the grapes, on their selection and transport. Even in wine-making an improvement has taken place since the appearance of phylloxera.

In conclusion, it may be said that if the invasion of phylloxera has been a calamity, all the sacrifices which it has entailed have been com-

pensated by the improvement and intensity of the present production and by its increased value.

Neither vine-growing nor wine-making in Portugal has anything to fear from comparisons with the same industries in any other country.

Portuguese viticulture as it is at present reconstituted, is still expanding, and bears witness, by the excellent results it has achieved, to the value of American stocks and of the modern technical processes of vine-growing and of wine-making.

The Recent Development of Cattle Breeding in Germany.

BY

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Owing to the expansion of trade throughout the world and to the development of flourishing industries, German agriculture underwent far-reaching changes during the second half of the last century. While the prices of grain have at times fallen considerably and are now again moderately rising, the prices of animal products have uninterrupted followed an ascending course. A population continually growing in numbers and in prosperity was inclined and able to increase to a great extent its consumption of animal products. It was thus that German farmers found in the rearing of live stock at least a partial compensation for the loss of their prospective profits on grain-growing.

Of course the single branches of live stock keeping were each of them differently affected by the altered economic conditions. The breeding of sheep, which had been carried on chiefly for the production of wool, was struck hard by the cheap colonial wool that invaded European markets and the gradually increasing prices of meat were not sufficient to make good the deficiency. It is true that a gradual change in the breeds of sheep kept had begun; namely from those producing only wool to those yielding wool and meat and even only the latter; still the number of sheep in Germany has fallen to a quarter of what it was in the sixties of last century and, notwithstanding the better prices for wool, this movement has not yet ceased. On the other hand, notwithstanding the notable extension of railways and the recent diffusion of the motor-car industry, the number of horses has increased at a fairly uniform rate. From 3.19 millions in the early sixties the number has risen to 4.35 millions in 1907, that is in the ratio of 100 to 136. The number of goats has also considerably increased, having risen in the same period from 1.82 millions to 3.53 millions, or as 100 to 194, and still greater is the increase in the number of pigs, which in 1861 was 6.46 millions and in 1907, 22.15 millions, that is in the ratio of 100 to 343.

The development of cattle breeding was not so striking. The much greater weight of the animals and their consequently greater food requirements, their slower growth and the longer life of the individual animals

which is not determined, as with pigs, only by the production of flesh, but extends over years for the production of milk and of muscular energy, rendered a rapid increase in the number of head impossible. Nevertheless the figures show considerable progress. The census for the whole German empire give the following returns:

		Head of Cattle		
1861	.....	14 999 194		
1873	.....	15 776 702	+	5.2 per cent.
1883	.....	15 786 764	+	0.1 "
1892	.....	17 555 834	+	11.2 "
1900	.....	18 939 692	+	7.9 "
1907	.....	20 630 544	+	8.9 "

At first, during the above period the increase was not much, but after the eighties it grew considerably. The returns of the census taken at long intervals of time for the whole of the German Empire show the increase in the number of cattle even during recent years to have been fairly uniform. In reality, however, such was not the case, for the development was irregular, as is proved by the yearly enumerations made since 1907 in the largest cities of the German Federation and in the Kingdom of Prussia.

In Prussia the head of cattle were:

In	1900	.....	10 876 972		
	1902	.....	10 405 769	-	4.33 per cent
	1904	.....	11 156 133	+	7.21 "
	1906	.....	11 646 908	+	4.40 "
	1907	.....	12 011 584	+	3.13 "
	1908	.....	12 089 072	+	0.65 "
	1909	.....	11 763 161	-	2.70 "
	1910	.....	11 592 521	-	1.45 "
	1911	.....	11 662 234	+	0.77 "

In the years 1902, 1909 and 1910 the number of cattle diminished. This was due to scanty forage crops and partly also to diseases. It is remarkable however that in 1911, during which year both the above mentioned adverse conditions obtained, a slight increase took place. This is the best proof that endeavours are being made in every way to increase the stock of cattle.

On each square mile of total area there were in 1873, 75.9 head of cattle, in 1892, 84.5 and in 1907, 99.1. With the increase of the population of the German Empire the number of animals has not quite kept pace. To every 100 inhabitants there were in 1873, 38.4 head of cattle, in 1892, 36.5 and in 1907, 33.0. It would however be erroneous to conclude that the present stock of cattle yielded less per inhabitant than it did in the seventies of last century. During this period not only have cattle grown in number but also, owing to better feeding and better breeding, they have much improved in precocity, live and dead weight, in milk yield and consequently also in

value. In regard to live weight and value, valuations were made in connection with the returns for 1883, 1892 and 1900, according to which the live weight increased between 1883 and 1900 from 100 to 132 and the value from 100 to 136, whilst the number of head increased only from 100 to 120. In other words, one average head of all age-classes weighed in 1883, 706.2 lb. and in 1900, 774.4 lb., which amounts to an increase of 10 per cent. in the live weight, and about the same in the yield. There is no doubt that the dead weight has increased in a higher degree. The greater precocity which leads to a younger stock and to a quicker sale of fattened cattle may be so far translated into figures as the proportion of cattle of the younger age-classes constitutes now a greater proportion of the total stock than formerly. It means a more rapid sale and this of animals possessing a higher dead weight. It has been calculated that in the last thirty years the production of beef and of veal has increased by 60 per cent. The greater number of cows, and further the improved milk yield of the individual cows, has also led to a higher production of milk. Though the assumption that the amount of milk produced in Germany has doubled since the seventies may be disputed, there can be no doubt that *the increase in the quantity of food stuffs produced by cattle rearing has sensibly outstripped the rise in the number of the population.*

As regards the distribution of the stock of cattle according to the acreage of the farms, and the changes that have taken place in this respect during the last 25 years, the following table showing the figures for the Kingdom of Prussia, gives a fair idea.

Farm	Acreage	Percentage		On 100 acres of cultivated area the number of head of cattle was in:		
		of cultivated area	of stock of cattle	1882	1907	1882=100
Cottagers	up to 5 acres	1.71	6.63	30.7	41.2	134.2
Small peasants' farms	5 to 12 $\frac{1}{2}$	6.34	13.06	25.5	27.5	107.9
Medium " " "	12 $\frac{1}{2}$ to 50	27.66	33.96	16.2	21.0	126.8
Large " " "	50 to 250	32.90	29.69	12.1	15.8	130.0
Large estates	250 and upwards	31.39	16.66	5.6	9.7	171.1

For the whole German Empire the conditions are very nearly the same. Of the whole stock of cattle, 6.6 per cent. is held by cottagers, while peasant farmers with farms ranging from 5 to 250 acres possess 81.8 per cent. and the large estates only 11.6 per cent., or much less than in Prussia. In proportion to the acreage the number of cattle diminishes with the extent of the farm. In this respect it is to be observed that the increase of cattle in large estates has quite recently become considerable. This is due

in the first place to the tendency to fill up the gap caused by the cessation or limitation of sheep rearing.

With the object of raising cattle breeding to its present level and to further it still more, great efforts have been made both by public bodies and by private persons. The activity of the Imperial Government is principally directed, besides to political and economical measures, to the control of plagues and diseases, in which a suitable protection of the frontiers is no mean part. The immediate measures for promoting cattle breeding are left to the individual States and to the special representative bodies. For the whole of Germany the figures are lacking, but Prussia has set apart, in the year 1910, a sum of a million marks, in round numbers (about £50 000), for the benefit of cattle breeding alone. Some of the other States of the Federation have in proportion to their area allotted still higher sums. On the means employed the following information will be of interest.

The choosing of bulls for breeding purposes by officials has been introduced with but few exceptions into the whole of Germany. For providing bulls for breeding purposes the South German States have followed the example of Baden and possess communal bull stations (*Gemeindestierhaltungen*) which, especially for small holdings, have been most beneficial. In North Germany there are the bull stations (*Bullenstationen*), which by means of the Chambers of Agriculture provide good bulls from funds loaned by the state without interest. These stations may be considered as the forerunners of the breeding associations, also inasmuch as they prepare the way for a certain unity in the trend of breeding. For the supply of male animals for breeding purposes there exist in several localities rearing stations, breeding-cattle farms and pedigree herds, which in part prepare bulls by suitably rearing young males bought for the purpose and in part they breed them themselves. Pedigree females are also sometimes bred, but not so frequently.

Recently a far-reaching influence in promoting breeding has been exercised by the breeding societies or breeding cooperative associations, often called herdbook associations. They depend upon private initiative and extend over areas of very different extent, in some cases over a whole province, in others over only a district. Often several small cooperative associations are united into a federation. The breeding associations deal only with the improvement of one breed, for which purity of breed is always the object aimed at, notwithstanding that sometimes recourse is had to crossing. One of the most essential tasks of the breeding associations is the collection of pedigrees, which are entered in the herdbook and published. On principle every animal, male or female, must be approved by specially appointed officials before being entered.

Recent researches have shown, in all branches of breeding, that there are always some few animals that stamp their characters upon a breed in which their blood flows. The use of the best blood, with a definite object in view, holds out to the breeding industry the most promising prospect, and will greatly facilitate bringing about uniformity in the animals of the various races. The activity of the breeding associations extends to every measure that tends to improve breeding. Thus, bull stations are established;

the use of valuable breeding animals is ensured for a length of time by means of maintenance prizes; exhibitions and distribution of prizes are held; performance records are kept; pastures for young animals are prepared; plagues and diseases are controlled; the sale of breeding animals is organized by means of markets and auctions. One or more of these measures is adopted according to local conditions. The breeding associations have attained, at present a highly flourishing condition under the influence of the German Agricultural Society (*Deutsche Landwirtschafts Gesellschaft*) which supervises their activity and "recognizes" them when they satisfy certain conditions, thus entitling them to exhibit at the great shows held every year in another place. In 1911 there were in Germany, for cattle alone, 101 breeding associations. Under their influence systematic breeding of certain races has arisen; in several parts of Germany its further development has been much assisted by the inspectors of breeding who have been charged with the professional oversight of the work.

Every year numbers of shows are held and prizes given, both local and district shows as well as provincial and national. The most important is the great German exhibition of the *Deutsche Landwirtschafts Gesellschaft*, which is held every year in turn in the various provinces, and which has powerfully stimulated all branches of German agriculture, including cattle breeding. Most of the shows are reserved to animals kept for breeding purposes; occasionally fat cattle shows are also held.

Besides the above mentioned aids to breeding, there are also the performance records, which, especially for milk, have been established chiefly in the North of Germany on the lines of the Danish control associations. Their number to-day is about 500. They record, with the assistance of special employé (control assistant), the yield of milk according to quantity and to fat content and ascertain at the same time the consumption of food for each cow. They have given a firmer basis to selection for breeding and have improved the feeding. The best cows have been recognized and their offspring, both male and female, has been reared. Further the proper use of concentrated foods according to the milk yield has been learned. Thanks to these control associations, the keeping of cattle has become more profitable.

From the above it will be seen that in Germany much importance is attached to the improvement of cattle breeding, for the attainment of which object ample means are provided and great efforts are made. Much still doubtless remains to be done, but it cannot be denied that a wholesome progress has been achieved and great hopes may be entertained for the future.

Measures adopted in Switzerland for the Introduction of Agricultural Book-keeping into the Peasants' Farms.

by

Professor Dr. ERNEST LAUR, of Zürich - Brugg.

During the last fifty years agriculture has made enormous progress. It has not only developed its technique in a high degree, but it has also adapted itself to the new economical conditions. While for many years it has measured its production only by the standards of its own wants, it has been forced by the general evolution of the world to wake up from its slumber, to introduce radical modifications in its systems and thenceforward to dispose of its produce on the great markets. It is thus that in a certain sense farming has come to resemble commercial and industrial enterprises. But whilst in these the principles of book-keeping have been adopted as the basis of their activity, and carelessly kept accounts are considered as a proof of a want of sense, and may in some cases fall under the rigours of the law, the great majority of farmers, even to this day, think that they can run a farm profitably without availing themselves of the guidance afforded by book-keeping.

This opinion is decidedly harmful to farming. Not only does it cause losses by the absence of the means of control, or by the introduction of measures that do not answer to the objects aimed at, but it is responsible on the one hand for the exaggerated prices paid for land and farms, and on the other for the low prices taken for the produce, which often do not cover the cost of production.

It is not rare to find that farmers do not know the rate of interest that their capital engaged in their farm is bearing; moreover, through lack of book-keeping, they are not in a position to say what prices their produce should command so as to cover the cost of production.

In order to remedy this state of things, far-sighted men have for a long time past been endeavouring to popularise the principles of book-keeping among the farming classes, but without however having succeeded in introducing them into general practice. It is therefore a matter for rejoicing that in Switzerland a number of peasant farmers have been gained over to this idea and now keep their accounts under the control of a central Bureau.

The work done in this connection by the Swiss Peasants' Secretariat has attracted the attention of numerous agricultural circles, and other countries have been stimulated to convert their farmers to these ideas. In Germany, especially, where the introduction of the income tax has caused the want of properly kept accounts to be keenly felt, the endeavours made with the object of introducing book-keeping into the practice of farming have been greatly facilitated.

In Switzerland the success which has attended the researches on the profitableness of farming is mainly due to the adoption of the following principles:

1. Selection of a system of book-keeping which spares the farmer unnecessary writing, but which enables him to balance his accounts correctly.
2. Uniform instruction for the accountants, who must engage themselves by an agreement to keep their books.
3. The balancing of the books to be done by a Central Office.
4. Comparative examination of the figures and use of the result in the study of questions connected with political economy and with the science of farming.

We shall endeavour to give a brief account of the way in which the researches have been organized in Switzerland.

1. *The system of book-keeping*: The various systems of book-keeping used by farmers may be divided into two distinct groups, on the one hand those which only determine the net returns of the property as a whole, on the other those which determine the profitableness of each of the different branches of the farm. The former of these methods is the one that has been adopted in Switzerland. It does not entail upon the farmer the work of following the exchange of values in the interior of the farm. It simply sets forth what the farm disposes of to third parties and what it gets from them and shows at the end of the year in what manner the amount of its capital has changed from what it was at the beginning of the same period. Nevertheless, under the term "third parties" the farmer and his family are included in connection both with eventual accessory undertakings and with consumption. As this latter is often connected with that of the salaried hand the common household is also considered as a third party. This system of book-keeping is therefore based on four accounts: *Farm, Household, Accessory Undertakings, Consumption*. The household account only plays the part of intermediary, and the expenses which it bears at the end of the year are distributed among the other three accounts in proportion to the number of persons maintained.

These four accounts must embrace the totality of the component of the farmers' capital, as well as all the income and outlay of money. The exchange in kind taking place between these accounts must also be determined, but not particularly within each account. In order to attain this object the farmer must draw up an *inventory* at the beginning and end of each year and must also keep a *cash account* and enter in a *housekeeping book* the exchange in kind between the several accounts. A personal account current will complete this system of book-keeping, which allows

the gross returns and expenses, the net income, the value of the farmer's labour, the interest his capital has produced, his household expenses and consumption, and the changes that his capital has undergone, to be known.

2. *Organization of the investigations.* In order to induce farmers to take part in them, the courses of book-keeping are announced by the agricultural press and by some of the political papers. The candidates are not admitted to the course unless they engage themselves by agreement to keep the accounts of their farm for at least one year, and to submit their books to be audited by the Secretariat, which examines them also as to the profitability of the farm. The candidates then take part in a three days' course for which all their travelling and living expenses are reimbursed and the necessary material, such as forms, etc., supplied free of charge. Besides this, when they give up their accounts they get an artistically designed diploma and a prize of 30 francs (about 24 shillings). Those farmers who, after having taken part in the course fail to keep their engagement, have to reimburse the Secretariat all expenses incurred on their behalf. It is to a great extent due to these measures that the majority of accountants submit their books to the Secretariat. With the object of encouraging farmers to continue keeping their books in the following years, the Secretariat supplies them with the requisite material and undertakes to balance their accounts for them. Those who for ten years have submitted their accounts to the control of the Secretariat are rewarded with a wine-cup, on which an inscription is engraved on its silver mounting, and their names are published. During the course of the first year each book-keeper is visited by an employé of the Secretariat who checks the books, especially the inventory, draws up, on a uniform plan, a brief description of the farm, discusses and settles all questions likely to present difficulties, such as deciding on the amount of retribution to be assigned to the farmer and to his family, or distributing the rent of the buildings, etc. The expenses of these researches, including the work done by the Secretariat, amount on average to 100 francs (about £4) per annum per farm.

3. *Closing the accounts.*—The accurate closing of the accounts of a farm is a more complicated affair than the same operation in a commercial business. The causes of this are, besides the difficulties encountered in questions concerning valuations, the intimate connection existing between production and consumption. The consequence is that if the use of book-keeping is to spread among peasant farmers, it can only be possible on condition that the closing of accounts be entrusted to a Central Office and not to the farmers themselves. This principle has been adopted in Switzerland, and the Peasants' Secretariat closes all the accounts. Two methods are followed: the *simple closing*, shows only the net returns and the income of the farms and of the accessory enterprises; the other, the *amplified closing of accounts*, also examines separately the various items of the gross revenue and of the expenses, without however doing the same for the net returns. The farmer receives only the simple closing of accounts. The two methods serve as a control on each other.

4. *Examination of results.* — The results of these books are submitted to methodical examination. The researches bear on the amounts of capital employed, on the outlay for labour and the other working expenses, as well as on the gross and net returns and on the income; the consumption is also examined. By means of these investigations knowledge is gained as to the influence which the extent of the farms, the manner of utilizing the soil and the kind of farming have upon the produce destined for the market, upon the intensity of the farm, etc. The figures obtained every year form the matter for new groups and thus the changes happening in the course of several years may be followed and observed.

Some of the principal results are given here below:

Years	Number of accounts closed	Expenses per acre	Gross revenue per acre	Net returns		Interest on capital per cent.	Remuneration of labour per work day and per head	Farming income (interest and remuneration of labour per day and per head)	Household expenses per day and per head
				per acre	per cent.				
		£ s. d.	£ s. d.	£ s. d.			s. d.	s. d.	s. d.
1901	110	6-10-4.5	8-0-7.3	1-10-3.2	1.94	0.82	11.3	2-3.8	11.5
1902	58	6-14-8.6	8-19-2.4	2-4-5.8	3.28	2.86	—	3-1.1	—
1903	137	7-13-9.5	10-5-8.4	2-11-10.8	3.63	3.29	1-11.1	3-3.0	11.9
1904	173	6-17-9.5	9-7-3.0	2-9-5.0	3.21	2.57	1-5.1	2-10.1	11.9
1905	204	7-12-3.2	10-2-0.7	2-9-9.5	3.27	2.90	1-7.1	3-1.6	1-0.4
1906	230	7-8-1.6	10-7-0.5	2-18-10.9	3.75	3.77	2-0.8	3-3.1	1-0.3
1907	250	7-4-7.7	10-10-4.2	3-5-8.5	4.02	4.22	2-1.1	3-4.5	1-1.1
1908	287	7-18-0.2	11-0-7.9	3-2-7.6	8.78	4.45	2-4.8	3-7.2	1-1.6
1909	276	8-10-6.8	11-6-10.3	2-16-4.0	3-31	3.01	2-2.6	3-5.4	1-1.9
1910	270	8-15-6.4	11-16-3.6	3-0-5.4	3.71	3.68	2-8.8	3-11.1	1-2.3
1911	283	9-4-10.4	12-5-6.8	3-0-8.4	3.65	3.49	2-9.7	3-11.1	1-2.6
Average 1901-05	684	7-3-8.3	9-8-10.8	2-5-2.0	3.11	2.46	1-6.1	2-13.1	11.8
» 1906-11	1596	8-3-7.4	11-4-5.5	3-0-10.1	3.70	3.77	2-4.8	3-7.9	1-1.7
» 1901-11	2280	7-16-7.3	10-10-4.1	2-13-8.6	3.41	3.19	2-0.5	3-3.5	1-1.2

SECOND PART

ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

- Decree approving the Regulation of the Brazilian Government Stations of Sericulture.

Actos do poder executivo. Decreto N. 9671 de 17 Julho 1912. — *Boletim do Ministerio da Agricultura, Industria e Commercio*, Year I, No. 3, pp. 11-16. Rio de Janeiro, 1912.

The Decree No. 9671, of July 17, 1912 approves the Regulations of Sericulture Stations created in conformity with Law No. 2544 of January 4, 1912, and enacts that the object of the Sericulture Stations is to study experimentally all the factors of the production of silk, so as to be in a position to provide farmers with precise data for the improvement of the methods of silkworm rearing.

The Stations are charged with the following duties :

1. — The study of all the conditions that are essential to the success of silkworm rearing.
2. — The study of the causes of epidemics and of the most efficient means of control.
3. — Carrying out experimental silkworm rearing with the object of producing silkworm eggs to be used in their turn for the production of other eggs.
4. — The production, selection, preparation and distribution to farmers of good silkworm eggs.
5. — The gratuitous microscopical examination of silkworm eggs, larvae, chrysalides, etc., at the request of persons interested in silkworms.
6. — The cultivation, and distribution to farmers, of varieties of mulberries adapted to the various localities.
7. — Testing new species of silk cocoons and new apparatus for rearing.
8. — Answering questions connected with sericulture.
9. — Practical study of the industrial utilization of the products of sericulture.
10. — Spreading by means of books and lectures, the improved methods of sericulture.

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11. — Surveillance of the process of silk rearing and advising as to the best means of improving it.

12. — Promoting the institution of silk factories.

13. — Spreading practical instruction in silk spinning and weaving.

The stations of sericulture shall not limit their activity to the study of the silkworm, but shall extend it also to silk, its preparation, properties and various uses. They are to be provided with buildings, laboratories, workshops, and cold storage chambers, in which to rear silkworms and impart practical instruction, and further with an experiment mulberry plantation to supply the necessary food for the worms. Two practical courses shall be held every year, one, lasting three months for men, and one of one month for women.

2 - The Position and Condition of the Prussian Rural Continuation Schools during the Financial Year 1911.

Stand und Verhältnisse der preussischen ländlichen Fortbildungsschulen im Rechnungsjahre 1911. — *Zeitschrift für das ländliche Fortbildungsschulwesen in Preussen* (1912) Part I, 1912-13, pp. 1-19. Berlin, October 1912.

In the year 1911, there were in the Kingdom of Prussia 5349 Rural Continuation Schools. Of these, 230 were established by districts (Kreis) 3904 by parishes (Gemeinde), 43 by Agricultural Associations, and 11 by private individuals and other agencies. The expenses of the schools were defrayed: in the case of 15 by the districts alone, in that of 21 by the parishes alone, while one was supported by Agricultural Associations, 11 solely by means of State contributions, 3973 by the State in conjunction with other interested parties, and 149 by private individuals and other agencies. The number of self-supporting schools was 3. The expenses, excluding upkeep, heating, lighting and cleaning of the school-buildings, amounted to £42 454. This expenditure was met by: £1855 derived from fees, while private individuals and institutions furnished £1432, Agricultural Associations £112, districts £4594, parishes £5438, Provinces £308 and the State £28715. The number of pupils was 86 689 and that of the teachers 75 of which 354 were ministers of religion, 4 agricultural teachers, 7 teachers in the elementary schools and 61 other persons. Instruction was given only during the winter in 5298 schools, and only 51 were open throughout the year. There were in 1911 761 more schools than in 1906.

Since 1896, the number of Rural Continuation Schools has increased from 570 in the Province of East Prussia, in that of West Prussia from 9 to 206; in the Province of Brandenburg from 1 to 310; in Pomerania from 3 to 233; in Posen from 22 to 566; in Silesia from 29 to 715; in Saxony from 43 to 211; in Schleswig-Holstein from 50 to 224; in Hanover from 138 to 711; in Westphalia from 15 to 280; in Hesse-Nassau from 325 to 874;

(1) Rural Continuation Schools are schools in which, chiefly in the winter months, instruction is given to the country youths (13-20 years of age) according to a fixed curriculum similar to that in force in the primary schools, special attention being given to agricultural subjects.

the Rhine Province from 244 to 293; in the Hohenzollern province from 51 to 56; in the whole State of Prussia from 930 to 5349. The total number of scholars rose in the same time from 13 307 to 86 689; the average number of students per school rose from 14.3 in 1896 to 16.2 in 1911. In the Provinces of Silesia, Hanover and Hesse-Nassau most of the school-attendance is compulsory, which accounts for the extraordinary increase in the scholars in those districts.

- Standardization of Instruction in Forestry in the United-States.

Report of the Committee of the Conference of Forest Schools. — *Forestry Quarterly*, Vol. X, No. 3, pp. 341-394. Ithaca, N. Y., 1912.

Within the last decade the number of forest schools in the United States has increased with remarkable rapidity. To-day there are 24 institutions which give courses leading to a degree in forestry, and about 50 others which include forestry in their curriculum. Over 500 young men are preparing themselves in these schools for forestry as a profession.

Within the last few years, it has been felt more and more that with a large number of forest schools there is a danger of lowering standards, and that it is desirable to attempt a standardization of forestry education.

The first step towards such standardization was brought about in December 1909, on the initiative of Gifford Pinchot, who called a conference of forest schools to consider the aim, scope, grade and length of curriculum. At this conference a committee was appointed to draw up a plan for the standardization of the requirements for technical training in forestry. There were appointed on this committee Henry S. Graves (chairman), B. E. Fernow, R. T. Fisher, Gifford Pinchot and Filibert Roth. The committee formulated provisionally a standard for forestry education, and called a second conference of forest schools in December 1911, in Washington, to consider its report.

The following institutions were represented at this conference: Yale University, Harvard University, University of Minnesota, Michigan Agricultural College, Massachusetts Agricultural College, New Hampshire College, University of Maine, University of Missouri, Iowa State University, University of Nebraska, University of Washington, Ohio State University, Case University, Pennsylvania State College, Pennsylvania State Forest Academy, and University of Toronto, Canada.

The provisional plan of the committee was discussed in detail by the conference and an expression of opinion by majority vote obtained as to requirements for admission, the courses to be given in the curriculum, the number of hours for each course.

The need for at least four different grades of training has been realized.

I. Advanced professional training to include not only a substantial liberal education but also a well rounded course in all branches of practical forestry.

II. Instruction for Forest Rangers, requiring merely a common school education and conducted mainly along thoroughly practical lines.

III. General instruction in forestry supplementary to a course in agriculture, and designed to assist owners in the handling of their own woodlands.

IV. General course in conservation and forestry designed for those who wish, as a part of their general education, to have some information on the economic problems involved.

The work of the Educational Conference held on December 28-29, 1919, was confined exclusively to formulating the requirements of the high grade professional course, and this report, therefore, deals exclusively with the standardization of a course for advanced professional training.

The Committee has recognized at the start that there is a constant growing need for specialists in forest work of three distinct types, besides general practitioners namely:

1) Foresters who have specialized chiefly along the lines of either forest management, or forest planting, or forest valuation or similar technical problems; 2) forest engineers; and 3) forest technologists. To develop specialists along these three lines within four years of college work is an impossibility. Therefore the scope of the courses considered in this Report has in view a well-balanced professional school which does not aim at great specialization in any of these three lines of work but attempts to give a general knowledge of the principles which underlie the entire field of the forester's activities, leaving the acquisition of specialized knowledge to be gained by the students after graduation.

The technical courses considered essential in a high grade school as the number of hours accepted by the Educational Conference as the minimum time to be devoted to each course are given in the following schedule:

Subject	Hours		Total
	Class Work	Field or Laboratory	
Dendrology, Forest Geography	60	66	125
Silvics and Silviculture	100	250	350
Tree Diseases	20	30	50
Forest Entomology	20	30	50
Forest Protection	20	with management	20
Forest Mensuration	40	100	140
Forest Management: Finance - Regulation - Working Plans	70	150	220
Forest Utilization:			
Lumbering-Engineering	90	190	280
Forest Products:			
Timber Physics - Wood Technology	50	100	150
Forestry History	20	—	20
Forestry Economics:			
Forest Policy - Forest Administration	95	—	95
	585	915	1 500

An attempt has been made in this report to describe at some length the scope of each course, outlining, at least for the most important courses in forestry, the fields which are to be covered in them.

But it is not the intention of the Committee to force the adoption of these exact outlines, since there is a full appreciation that on account of the personnel of the teaching staff and other practical considerations, there must be considerable latitude left to each school to arrange its course in such a way as to meet its special needs and use its particular facilities.

- Instruction in Cold Storage Methods in France in 1912-1913.

L'enseignement frigorifique en France en 1912-1913. — *La Revue Générale du Froid*, Year 4, Vol. IV, No. 11, pp. 607-609, Paris, November 1912.

In 1912-1913 the following courses of instruction in cold storage methods will be held in France.

1. — Course given by M. M. Marchis and Maillard at the Higher School of Aeronautics and of Mechanical Construction of Paris.
2. — Evening course held by M. Blanchet at the Philotechnical Association of Paris.
3. — Course held at the Central School of Arts and Manufactures of Paris.
4. — M. Jules Henriet's course at the Marseilles Polytechnic Association.

The instruction in the first course is directed to satisfy the requirements of the examination for the diploma of Cold Storage Engineer given by the French Cold Storage Association.

For detailed programmes see the original publication.

- An Enquiry into the Condition of Association in Swiss Agriculture.

Enquête sur l'état de l'Association dans l'Agriculture Suisse. — *Exposé du Secrétariat suisse des paysans*, No. 44, pp. 1-138, Berne, 1912.

The enquiry made by the Swiss Peasants' Secretariat for the purpose of determining the number of Agricultural Associations, Syndicates, Corporations, Societies and Leagues, together with their aims and the number of their members, extends to the whole of Switzerland.

According to this enquiry, the latter country possesses 6230 local associations. The number of the members has been ascertained in the case of 6065 of these (97.3 per cent.) and amounts to 293 719; on adding to this figure, the members of the 95 cantonal, intercantonal, and national organisations, the actual number of members belonging to the agricultural associations of Switzerland is 380 129. There are in Switzerland, in addition to the "Union suisse des paysans", 81 cantonal, intercantonal and national organisations formed by the Union of Associations; these possess a total of indirectly attached members amounting, according to this enquiry, to 346 225; on adding the 144 377 members of the Union suisse des paysans, a total of 870 731 persons affiliated to Agricultural organisations in Switzerland is obtained.

The following table has been drawn up for the purpose of classifying the different associations according to their aims:

Kind of Association	Number of Associations			Actual No. of Members
	Total	Having given list of their members		
		Number	Per cent.	
1. Agricultural Associations	856	841	98.3	266 876
2. Agricultural Cooperative Societies . .	567	561	99.0	105 728
3. Dairy Associations	2 819	2 766	98.1	140 471
4. Breeding Syndicates	1 293	1 268	98.1	78 904
5. Fruit-growing Associations	80	78	97.5	9 326
6. Vine growing Associations	57	55	96.5	4 986
7. Threshing Associations	133	129	96.9	3 946
8. Distilling Associations	53	51	96.2	974
9. Associations of Mills and Bakeries . .	42	41	97.2	6 447
10. Associations for Improvements, Drain- ing and Irrigation	73	69	94.5	3 628
11. Associations of Alpine Economy . . .	233	183	78.5	11 167
12. Agricultural and Horticultural Associa- tions	15	15	100.0	1 874
13. Associations of Agricultural Credit . .	145	145	100.0	18 636
14. Agricultural Insurance Associations .	41	39	95.1	73 391
15. " Union suisse des paysans "	1	1	100.0	144 377
Total	6 408	6 242	97.4	870 731

* Switzerland possesses, according to the census of Aug. 9, 1905, a total of 243 710 farms of which the soil is cultivated; this gives a coefficient of representation for each farm of 3.56 for the associations with directly attached members, together with those composed of sections; and a coefficient of 1.55 for the associations possessing only directly attached members. Since many cases occur in which one person is a member of several associations, it is impossible to say exactly how many of the farmers belong to agricultural associations, and how many are not members of these bodies.

- Proceedings of the Sixteenth Annual Meeting of the American Association of Farmers' Institute Workers.

BEAL, W. H. and HAMILTON, JOHN: *U. S. Department of Agriculture: Office of Experiment Stations, Bulletin 251*, 75 pp. Washington, September 18, 1912.

At the sixteenth annual meeting of the American Association of Farmers' Institute Workers, the Committee on institute organization and methods presented a report in which some statistics are given which indicate the vastness of the farmers' institute work now being undertaken in America.

During the fiscal year ending in November 1911, there were held in the United States 16 741 sessions of regular farmers' institutes. These were made up of 3539 one-day meetings, 1942 two-day meetings, and 172 three or more day meetings, representing 7935 days of farmers' institute work. The attendance reported at all institutes was 2 412 600 persons. Attendance upon agricultural trains 995 220. The appropriation from all sources of support for the farmers' institutes was \$445 193.

In many States three or more forms of instruction in agriculture and domestic economy are now being supplied the people outside the colleges, namely 1) the farmers' institute proper, 2) the operation of agricultural trains, 3) the conducting of demonstrations, 4) the holding of one-day schools or campaigns, 5) the organization of boys' and girls' clubs, the establishment of the woman's auxiliary as a special feature of the institute work. The farmers' institute proper is but one phase of the general extension movement.

Fundamentally, the farmers' institute is not by nature a well-disciplined school consisting of teacher and taught. Instruction here assumes the form of positive statements, the declaration of established principles and the presentation of material facts of value to the producers of the country.

A successful farmers' institute must accomplish at least four things: 1) yield practical information to those having agricultural problems to solve; 2) more clearly define the farm problems of a community; 3) widen the circle of institute interest and influence; and 4) leave a permanent local organization, club, or institute that stands for agricultural progress.

Thirty-five States have recognized the importance of the farmers' institute work by providing specific appropriations for State support. The amount so appropriated for the past fiscal year aggregated \$ 372 430.

International Exhibition of Import and Export Products in Barcelona, Spain, from April 28 to July 2, 1913.

Daily Consular and Trade Reports, 15th Year, No. 232, pp. 32-33; No. 282, p. 1116. Washington, Oct. 2 and Nov. 30, 1912.

The exhibition will include, among others, the sections: Alimentation, Agriculture and Horticulture. Applications for space should be addressed to "La Exposición Internacional de Productos de Importación y Exportación, Barcelona". Branch offices of the exhibition are also located at 18 Boulevard Voltaire, Paris, France, and 87, Rue des Foulons, Brussels, Belgium.

8 - International Colonial Exhibition at Samarang, Dutch East Indies, in 1914.

The Board of Trade Journal, Vol. LXXIX, No. 838, p. 603. London, December 19, 1912.

An International Colonial Exhibition will be held at Samarang in September, 1914. The exhibition will comprise sections for agriculture and horticulture (including machinery, etc., for cultivation and manufacture of sugar, coffee, etc.); the industries of the Dutch East Indies; foreign industries (including machinery and appliances for a) supplying motive power, b) agricultural and forestry purposes, c) industrial purposes, d) general purposes, and e) household purposes); commerce, etc. Applications for space must be sent, not later than March, 1914, to the Secretary of the Exhibition, Samarang, or to the Office of the N. V. Nederlandsch-Indisch Publiciteits Bureau, N. Z. Voorburgwal 254, Amsterdam.

9 - Bristol Show, from 1st to 5th July, 1913.

Royal Agricultural Society of England. Annual Show at Bristol. Tuesday, July 1st, Saturday, July 5th, 1913.

10 - Agricultural Exhibition at the Hague in 1913.

The Board of Trade Journal, Vol. LXXIX, No. 836, p. 494. London, December 5, 1911.

A National and International Agricultural Exhibition is proposed to be held at the Hague from the 3rd to the 15th September 1913. Entry forms and full particulars may be obtained from the Secretary of the Royal Netherlands Agricultural Society, 42, Buitendorp, The Hague.

11 - The Great Agricultural Week in Belgium in 1913.

La Grande Semaine agricole belge de 1913. — Laiterie et Elevage, Year 7, No. p. 180. Louvain, November 30, 1912.

The Society of Agricultural Mechanics and of Agricultural Industry has just fixed the date of the 5th exhibition of agricultural machinery which will be held at the Palais du Cinquantenaire in Brussels from March 8 to 17, 1913.

As was the case last year, this exhibition will coincide with the Great Agricultural Week in Belgium.

Persons desirous of obtaining either the programme of the Exhibition of Agricultural Machinery, or the programme of the Great Agricultural Week, should apply to the Société de mécanique et d'industries agricoles, 20 Rue Neuve, Bruxelles.

12 - International Forestry Congress, Paris, June 16-20, 1913.

From the programme of the Congress communicated by the "Touling Club de France," which is organizing the Congress, the following chief points may be reported.

1st. Section. — Forestry technique, or sylviculture: *Lengthening coppice rotation and coppice-with-standards. Forest fire insurance. Fire protection.*

- 2nd. Section. — Forest economics and legislation: *Rating of woodlands.*
 3rd. Section. — Forestry technology.
 4th. Section. — Forestry work on a large scale: *Improvements of pastures. Recovery of mountains. Trees and water.*
 5th. Section. — The forest in the development of touring and the esthetic education of the people: 1) *Beauty of the country due to forests.*
 2) *National parks.* 3) *Management of forests from the tourist point of view.*
 4) *Sylvo-pastoral instruction.*

Art. 3 of the Regulations of the Congress provides that:

The Congress is to consist of French members and of foreigners; the subscription is fixed at 20 fr. and requests for admission are to be addressed to the President of the Organisation Committee, Headquarters of the Touring Club de France, Paris (65, Av. de la Grande Armée), naming the section which the member wishes especially to attend.

3- Fourteenth International Poultry Exhibition in Paris in February 1913.

14^e Exposition internationale d'Aviculture. — *Revue d'Aviculture technique et commerciale*, No. 40, p. 339. Paris, October 1912.

The "Société des aviculteurs français" announces that its Fourteenth International Exhibition of Poultry will be held on the first Friday in February 1913. This exhibition will also include a "fur and feather" section. Detailed information can be obtained from the Secretary of the Federation of French purveyors of eggs, fowls and game: Paris, 136 rue de Rivoli.

CROPS AND CULTIVATION

Investigations on "Sickness" in Soil, Soil Sterilisation, and Some Practical Applications.

1. RUSSELL, E. J. and GOLDING, J. Investigations on «Sickness» in Soil. I. Sewage Sickness. — *The Journal of Agricultural Science*, Vol. V, Part I, pp. 27-47. Cambridge, Oct., 1912.
2. RUSSELL, E. J. and PETHERBRIDGE, F. R. Id. II. «Sickness in Glasshouse Soils». — *Ib.*, pp. 86-111 + plates II-V.
3. STONE, E. G. The present status [of soil sterilization. — *Twenty-Fourth Annual Report of the Massachusetts Agricultural Experiment Station, Part I., Detailed Report of the Experiment Station*, pp. 121-125 + figs. 1-2. Boston, 1912.
4. LODGE, C. A. and SMITH, R. G. Influence of soil decoctions from sterilized and unsterilized soils upon bacterial growth. — *Ib.*, pp. 126-134.
5. See No. 45, B. Jan. 1912 and No. 485, B. March 1912.
6. Cf. *Lafar's Handbuch der Technischen Mykologie*, III. Band; V. BEHRENS, J., *Mykologie des Dungens und des Bodens*, § 116, pp. 447-450. Jena, 1904-1906.
7. Cf. LÖNNIS, P. *Handbuch der landwirtschaftlichen Bakteriologie*, V. C. Die Beeinflussung der Tätigkeit der Bodenorganismen, pp. 732-790. Berlin, 1910.

Russell, and Hutchinson have shown that micro-organisms of ordinary soils are not working at a maximum efficiency; that there exists

a biological factor, provisionally identified with the soil protozoa, detrimental to bacteria and limiting their numbers and activities. It may therefore be found that causes not in themselves harmful to bacteria may bring about a reduction of bacteria through favouring the detrimental factor.

1.* — Russell and Golding have studied the soil of a sewage farm, which about three years ago showed marked signs of « sewage sickness ». At this farm the sewage is simply screened and then applied to land that has been ploughed and is later to be cropped; elsewhere it is applied direct to growing crops. So long as percolation is rapid the method works well, but « sewage sickness » sets in when percolation becomes too slow.

Examination of a sewage-sick field showed that the falling off in the rate of percolation was due to at least two causes. Wherever a pool of sewage had stood a green-black slime was found; the green material at and above the water-level was seen to contain living organisms. A second cause is the deflocculation of the clay by the free alkali of the sewage. Both these causes render the soil sticky and impermeable; but they can be put out of action: the deflocculation by dressings of lime and the accumulation of the slimy material by ploughing up the land into ridges and allowing it to dry.

There is however another factor. Analysis of the soil and laboratory partial sterilisation experiments have shown that a factor detrimental to bacteria can be traced in sewage-sick soils. This factor appears to be in every respect similar to that shown by Russell and Hutchinson in ordinary soils. It is put out of action by the same antiseptics (carbon disulphide and toluene) and by heat. It is not bacterial nor is it any bacterial product; it is not carried by an aqueous extract of the soil. On the other hand it is transmitted to partially sterilised soils by inoculation with untreated soil; it is not rendered inactive by aeration or by liming. Its effects are, however, much more pronounced in sewage-sick soil than in ordinary soil. While the bacteria in the untreated sick soil only rarely rise to 40 millions per gr., they may rise to 400 millions per gr. in the partially sterilised soils. The high amount of moisture and organic matter in the sewage-sick soil appear to be especially favourable to the harmful factor.

Sewage sickness is thus regarded, in part, as an abnormal development of the harmful factor always present in ordinary soils. As in the case of ordinary soils, all the properties of the harmful factor indicate that it is biological and is due to organisms larger than bacteria. Examination of the untreated soil showed the presence of amoebae and other protozoa, some of which could be separated in an active form by centrifuging; none were present in the partially sterilised soil. All the evidence available then points to these as constituting the harmful factor.

As to the economic problem of applying these results to the treatment of sewage-sick land, particularly with the view of ascertaining whether

partial sterilisation of the soil causes increased purification of the effluent, whether any modifying factors come into play when the experiment is conducted in the open field, besides an experiment with a number of small land filters filled with partially « rested soil », a series of small plots was laid out, the weights of turnips produced being, in thousands of pounds per acre :

Plot treatment	Untreated	Pared and burned	Treated with carbon disulphide	Treated with toluene
Total produce . . .	26.4 30.2	31.8	32.6	36.8

Larger plots of $\frac{1}{10}$ of an acre were set out on the Midland Agricultural College sewage farm at Kingston-on-Soar and drains were laid 18 in. deep, so that the effluents from each could be tapped. One of two pairs of comparable plots was treated with commercial « toluol » at the rate of 1 cwt. per acre, the injections being about 3 in. apart and 6 in. deep. General inspection showed that the effluent from the toluol treated plot was the better in each case both in colour and in smell, and the same fact is shown by the analyses of the effluents.

The present practical conclusion is that after the harmful factor is killed by partial sterilisation, the bacteria multiply rapidly and rise to high numbers, effecting more decomposition of the added sewage so that a purer effluent is obtained. No complicating factors appear to be introduced when the method is tried on a large scale, and it is little doubted that once the practical difficulties of partially sterilising large quantities of soil are overcome it will find useful application in sewage farm practice wherever the rate of decomposition is limited by the numbers of bacteria.

2. — Russell and Petherbridge had already shown that partial sterilisation affords a satisfactory method of treatment of « sickness » in glasshouse soils, and trials made in commercial glasshouses have shown that it is also practicable on a large scale, especially in tomato and cucumber houses. Further conclusions are :

I. Sickness in glasshouse soils is conditioned by at least two factors :

- (a) an accumulation of insect and fungoid pests,
- (b) a lowered bacterial efficiency.

II. The lowering of the bacterial efficiency is due to the accumulation of a factor detrimental to bacteria. This factor resembles in every way that present in arable soils ; it is put out of action by heat or by antiseptics ; in all respects its properties agree with those of protozoa.

III. There is no evidence that sickness is due to an accumulation of bacteria acting unfavourably on the production of plant food, *e. g.* detritifying bacteria ; or that the beneficial effect of partial sterilisation is due to the destruction of such bacteria ; so far, it has been found that bacterial actions are accelerated in partially sterilised soils.

As to the commercial treatment of sick soils, two general systems may be adopted: the soil may be heated to 90-100° C., or it may be treated with some antiseptics. These systems are fundamentally different. At 90-100° a certain amount of decomposition takes place, with formation of products having important secondary effects on the plant. Treatment of the soil with antiseptics causes much less decomposition, but certain secondary effects are seen in this case also. Thus, in discussing method of treatment capable of application on a large scale, regard must be had not only to the cost and practicability, but also to

- (a) the effect on the bacterial activity in the soil,
- (b) the effect on disease and parasitic organisms,
- (c) the secondary effects on the plant.

Exposure to a temperature of 96°-98° C. for two hours has proved the best method, because it not only kills destructive and parasitic organisms, including *Heterodera*, but also effects a certain amount of decomposition, thus lightening the subsequent work of the bacteria and bringing about certain secondary results, notably a great development of fibrous root. This treatment is practicable on a large scale, but the present cost of heating one ton of soil is about 1s. to 1s. 6d. A temperature of 55° C. maintained for 3 hours suffices to kill destructive and parasitic organisms and thus remedy sickness, but it does not effect the secondary changes.

An application of antiseptic may prove more convenient than heat if the purely mechanical difficulty of distribution is overcome. The antiseptic should be some cheap substance or mixture of substances that can:

- (a) put out of action the factor injurious to bacteria;
- (b) kill *Heterodera* and the spores of parasitic disease fungi in the soil;
- (c) when its work is done disappear from the soil by volatilisation, oxidation or other decomposition, leaving no permanent bad effects behind;
- (d) if possible lead to the same fine root development as a temperature of 98° C.

Russell and Petherbridge give a list of six classes of substances that more or less satisfy the first three conditions: formaldehyde; the lighter hydrocarbons of the tar oils — benzene, toluene, and the light homologues present in the so-called light solvent naphtha and heavy solvent naphtha —; the heavier hydrocarbons of the naphthalene fraction; the tar acids — phenol, cresylic acid, etc. —; the tar bases — pyridene and the homologues —; calcium sulphides. Of these the lighter hydrocarbons are not convenient for large scale work because of the cost of transport and the difficulty of application; the others are more suitable; they are carried at ordinary rates and are readily put on to the soil because they are or can be made miscible with water. Further investigation however is necessary to discriminate between the various substances; in the meantime it is insisted that no waste product

ould be recommended until it can be obtained to a definite specification, and the behaviour of its separate constituents is known.

3 and 4. — A somewhat different point of view is entertained by Stone and his pupils, of the Massachusetts Agricultural Experiment Station. They recognise the stimulant effects of soil sterilisation on plant growth, but they maintain that the benefits resulting from soil sterilisation depend upon the chemical and physical conditions rather than upon the number of protozoa.

Lodge and Smith have carried on three series of experiments with two types of soils, a loam rich in organic matter and a subsoil deficient in organic matter. 400 gr. of each soil were placed in a percolation tube and lukewarm distilled water was allowed to percolate several times through the soil; the percolated water was then placed in flasks, each flask containing 100 c. c. of percolate; then the decoction was subjected to steam pressure of 15 lb. for 45 minutes and at 121° C.

In series No. 1 a sterilised and unsterilised loam were used, and the sterilised decoctions inoculated with ordinary soil bacteria; the sterilised and unsterilised decoctions were found to contain a far greater number of bacteria than the unsterilised decoction. In series No. 2 a sterilised and unsterilised loam, and in addition a sterilised and unsterilised subsoil, were used, and the sterilised decoctions inoculated with ordinary soil bacteria; when a sterilised loam was used a greater number of bacteria were also present than in the unsterilised loam decoction; but when a sterilised and unsterilised subsoil were used in the decoctions, a greater number of bacteria were found in the unsterilised decoction; this fact was assumed by the experimenters to prove that the sterilising of this particular soil resulted in adverse conditions for bacterial increase, and that decoctions made from different soils affect the growth of bacteria in a decidedly different manner. The remaining contents of the soil culture used in inoculating decoctions in the experiments of series Nos. 1 and 2 were subjected to a careful microscopic examination; no protozoa were found; neither were they observed to be abundant in a number of samples of the loam and subsoil. To avoid any possibility of introducing protozoa at the time of inoculating the decoctions, in the experiments of series No. 3 a sterilised and unsterilised loam and subsoil were used, as in series No. 2, but inoculations were made from a pure culture of *Bacillus subtilis*; the data given show that *Bacillus subtilis* multiplies in great numbers in all decoctions; a great number were found in the sterilised loam decoction as compared with the unsterilised and also a greater number were found in the unsterilised subsoil decoctions than in the sterilised decoctions.

The stimulating or retarding effects on the development of bacteria in the two types of sterilised soil used are similar to those produced in the previous experiment upon the growth of crops in these soils.

Growth of Soy Beans in Sterilised and Unsterilised Loam and Subsoil.

	Number of Pots	Average Length of Stems in unsterilised sterilised Soil Soil		Gain or Loss in sterilised soil	Per cent.
		cm.	cm.		
Loam	4	9.53	10.87	+	14.03
Subsoil	4	9.79	4.14	—	17.70

These experiments, made with a different soil, would not confirm those of Russell and Hutchinson, who maintain that protozoa influence the number of bacteria in soils, since the development of bacteria differs in soil decoctions according to the composition of the soil used; that is, the number of bacteria which develop in a soil would depend upon the chemical and physical conditions rather than upon the biological conditions. These experiments, however, do not necessarily preclude the idea that protozoa might play a much more important rôle in soils other than those experimented at the Massachusetts Experiment Station Amherst, Mass.

PROVISIONAL CONCLUSION.

I. It can be fairly stated, that partial sterilisation, especially of soils, may prove an efficient method of stimulating the development of bacteria and therefore of plant growth.

II. It is not equally sure if the limiting factor of bacterial growth be a biological, or a chemical and physical property of the soil; perhaps this factor may differ according to circumstances.

15 - Researches on Alkaline Meadows and Pastures.

FLODERER, A. (Chemist at the Agricultural Experiment Station of Magyaróvár, Hungary). A békésesabai szikes üntözött réten és legelőn folytatott sziktanulmányok Országos m. kir. növénytermelési Kísérleti állomás, Magyaróvárott. — *Kísérleti és Ismeretk.* Vol. XV, No. 3, pp. 390-418. Budapest, July-September, 1912.

The Agricultural Experiment Station of Magyaróvár has made at Békés-esaba during the last 10 years a series of experiments on irrigated alkaline meadows and pastures (« Szik ») to determine whether irrigation diminishes the amount of alkaline salts, or in other words, if the alkaline soils can be thus modified and improved. To obtain detailed data respecting the distribution of the salts in the soil, the writer made several borings on the same plot and studied, not only the superficial layer, but also the strata at depths of from 30-120 cm. (12 to 48 inches) and estimated the salinity of these. The summary of his results was as follows:

Irrigation produces a certain amount of lixiviation of the harmful salts; the diminution in soda, the alkali which is the most injurious plants, being especially noticeable.

The removal of the salts, which is effected chiefly at the commencement of irrigation, together with the increased water supply, explains the maximum yields obtained during the first three years. The plan

only grew more vigorously, but the good species became predominant. improvement takes place chiefly in the superficial soil. The richer first stratum of 30 cm. (12 in.) is in salts, the greater is the improvement, for as the roots do not penetrate very far into stiff alkaline soil, the part played by the sub-soil is negligible.

In the case of a more intensive cultivation of the superficial layer, more must be had after some time to a systematic use of fertilizers. manuring of alkaline soils only attains its ends if the former are moved to the point of growing the most useful plants in a satisfactory manner. Where the amount of alkali present is large in clay soils, phosphatic and nitrogenous fertilizers are of advantage, potassic fertilizers are of no effect.

With regard to the powers of resistance possessed by various plants, beets can grow in a soil containing from 0.15 to 0.2 per cent. of soda; but mangolds are able to develop in the presence of even larger quantities. Lucerne, on account of its long roots, can only be cultivated where the salts content is from 0.1 to 0.15 per cent., or at most, from 0.2 to 0.2 per cent. The presence of soda, however, greatly hinders development. *Lotus corniculatus*, on the other hand, still grows in soil containing 0.2 to 0.3 per cent. of salts and 0.14 per cent. of soda; it resists alkalinity in the soil better than lucerne or red clover, the latter being a more delicate plant than lucerne.

The Composition of Soil Suitable for Rubber Cultivation.

OELTMANN, F.: Südamerikanische und Ostafrikanische Kautschuk Böden. — *Der Tropenpflanzer*, Year 16, No. 11, pp. 571-581. Berlin, November, 1912.

The writer, Director of the Agricultural Institute of the University of Halle, has analysed samples of the soils which were most suitable for growing rubber and which had been sent from Brazil ("Seringal", São Paulo, near Mt. Alegre), from Bolivia ("Seringal", Philadelphia, near La Paz), from the higher basin of the Amazon and from German East Africa.

The following table gives some of the detailed results obtained by the writer.

In comparing the fertility of the soils of South America with those of East Africa, it is necessary not to lose sight of the fact, that in the former country the annual rainfall is 120 inches, while in the latter it only amounts to 80 in. near Tanga and in East Usambara, and 48 in. in Zanzibar. Thus, in the soils of South America the nutritive substances are more transportable and more easily assimilated than in the soils of East Africa, which would only be as fertile as the former if they contained about 33 per cent. more of nutritive substances. The species of rubber trees cultivated are different in the two cases: *Hevea brasiliensis*, which requires an abundant rainfall, is cultivated in South America, and *Glaziovii*, which fares best in a dry climate, is grown in German East Africa. But the products obtained are chemically the same, whence it is believed that both species require the same, or nearly the same, soil.

Composition of some of the best rubber soils.

Type of soil	Source	Nitrogen	Lime	Magnesia	Phosphoric acid	Total potash
		per cent.	per cent.	per cent.	per cent.	per cent.
Fine loam	Springal, São Francisco, Brazil	0.085	0.050	0.116	0.076	0.233
"	Springal, Philadelphia, Bolivia	0.124 - 0.147	traces	traces	0.026 - 0.038	0.272 - 0.442
Sandy clay	Tanga	0.077 - 0.225	0.180 - 0.360	0.023 - 0.042	0.039 - 0.052	0.027 - 0.033
"	Longusa	0 - 0.058	traces - 0.026	traces - 0.009	0.012 - 0.055	0.134 - 0.325
Typical red soil	East Ngambo II	0.11 - 0.39	0.013 - 0.080	0.007 - 0.015	0.127 - 0.229	0.399 - 0.471
Red humic soil	Usambara Magunga	0.11 - 0.26	0.09 - 0.37	traces	0.28 - 0.35	0.32 - 0.46
Brown loam	Morogoro II	0.09 - 0.16	0.18 - 0.253	0.29 - 0.43	0.111 - 0.174	0.616 - 0.871
Dark red soil	" IV	0.12 - 0.15	0.073 - 0.127	0.051 - 0.081	0.055 - 0.149	0.34 - 0.48
Laterite	" V	0.038 - 0.135	0.005 - 0.080	0.019 - 0.076	0.03 - 0.068	0.112 - 0.595
Medium red soil	" VI	0.105 - 0.165	0.033 - 0.09	traces	0.08 - 0.12	0.341 - 0.533

This idea seems to be confirmed by the analytic results of the writer. He considers himself justified in deducing the following conclusions regarding the selection of a good soil for rubber trees :

1. Such a soil should be fine, of medium coherence, rather loose than heavy, and deep. The combined fineness and depth of the soil bring about a dampness, which appears to be indispensable to the formation of latex. Loams or clay loams with from 95 to 100 % of fine articles are the soils to be preferred, those rich in laterite, or iron compounds, are apt to be deceptive, while compact clays, and especially soils with extreme characters, should be rejected.

2. With regard to the nutritive substances :

a) It is not necessary that the nitrogen content should be high; large percentage of humus is perhaps downright injurious; 0.1 per cent. of nitrogen is sufficient, especially in districts with a large rainfall.

b) As for lime and magnesia, rubber trees only need very limited amounts of these substances. It is not yet known whether a high percentage of lime and magnesia hinders latex formation, or if the trees suffer in calcareous soils.

c) The rubber tree appears to have no special requirements as regards content in phosphoric acid.

d) It seems, on the other hand, that a large amount of potash in the soil promotes growth and the formation of latex; it is therefore advisable to use fertilizers containing potassic salts.

7- Soils from the East Africa Protectorate.

Bulletin of the Imperial Institute, Vol. X, No. 3, pp. 405-422. London, Oct. 1912.

Analyses of a certain number of soils from the East Africa Protectorate have already been published in the above Bulletin (1907, Vol. 5, p. 243), and a further series are now given.

The results are tabulated in the accompanying table. The lime is deficient in almost all cases, except in the Jubaland soils. Phosphoric acid also most consistently deficient whilst the nitrogen content varies considerably. The potash is abundant everywhere and an analysis of rock struck while sinking a well indicates that the source of these large supplies is adesite. In the Jubaland soils the soluble alkali salts are very high and could have to be taken into consideration in subsequent treatment. Applications of ground rock phosphate, ground limestone, and green manure are recommended to supply deficiencies of phosphates, lime and nitrogen respectively.

Analyses of Soils from the East Africa Protectorate.

Soil	Texture	Lime		Phosphoric acid		Potash		Nitrogen
		Sol. in HCl		Sol. in HCl	available	Sol. in HCl	available	
Soysambu (1st series)	sandy loam	1.25		0.223	0.126	1.18	0.195	0.151
Njoro 1	sandy loam	0.34		0.023	0.003	0.245	0.015	0.202
" 2	sandy loam	0.36		0.24	0.003	0.259	0.033	0.181
Surface of well	clay loam	0.587		0.013	0.0007	1.239	0.068	0.009
Soysambu 1 (2nd series)	loam	1.900		0.054	0.005	1.665	0.113	0.164
" 2	sand	0.325		0.037	0.0018	0.995	0.059	0.009
" 3	sand	0.362		0.007	0.003	2.630	0.046	0.120
" 4	sandy loam	0.237		0.031	0.012	3.660	0.051	trace
" 5	sandy loam	0.435		0.041	0.009	2.804	0.092	0.140
Tana 1	fine loam	4.22		0.21	0.001	4.25	0.028	0.054
" 2	clay loam	2.47		0.20	0.0007	1.71	0.025	0.055
Jubaland 1	clay	3.89		0.18	0.022	1.35	0.030	0.080
" 2	sandy	2.04		0.04	0.016	0.85	0.031	0.05
" 3	loam	4.35		0.17	0.045	0.97	0.012	0.04
" 4	sandy	5.13		0.17	0.014	0.59	0.014	0.11
" 5	loam	7.50		0.19	0.002	0.61	0.007	0.09

8 - Irrigation in the United States.

1. STABLER, HARRY SNOWDEN: The Safe Side of Irrigation Investments.

2. The Future of Irrigation. — *The Country Gentleman*. Vol. LXXVII, No. 38, pp. 3. and 18, No. 40, pp. 4, 5 and 20, No. 47, p. 1. Philadelphia; September 21, October 26, November 23, 1912.

Seventy millions of dollars (about £14 400 000) have been invested by the United States Government in irrigation. Thirty-two reclamation projects, located in eighteen States, have been completed or are in process of development. At the end of the last fiscal year the operations completed included Government reservoirs with a capacity sufficient to irrigate 5 000 000 acres to a depth of one foot, 300 miles of canals, 1000 miles of ditches, 5 000 miles of watercourses, 20 miles of tunnels, etc. Further, the Reclamation Service will expend twenty million dollars (about £4 100 000) on irrigation works before the end of 1914. Water is now being served to 14 000 farm families. For 1911 the crop production on the irrigated territory was estimated at \$12 000 000 (about £2 460 000). The Government still possesses about a quarter of a million acres of land for which water is available under completed or partly completed works.

Extent of Irrigation in the United States.

	Acres irrigated in 1909	Per- centage of total	Acres that could be irrigated in 1910	Per- centage of total	Acres included in projects	Per- centage of total
Arid region	13 739 499	100.0	19 335 711	100.0	31 112 110	100.0
United States Reclamation Service	395 646	2.9	786 190	4.1	1 973 016	6.3
United States Indian Service	172 912	1.2	376 576	1.9	879 068	2.8
Lacey Act enterprises	288 553	2.1	1 089 677	5.7	1 573 874	8.3
Irrigation districts	533 142	3.9	804 951	4.2	1 589 865	5.1
Cooperative enterprises	4 646 039	33.8	6 194 677	32.0	8 845 437	28.4
Commercial enterprises	1 444 806	10.6	2 416 516	12.5	5 096 337	16.3
Individual and partnership enterprises	6 258 401	45.5	7 667 124	39.6	10 154 513	32.6

The valuation of the returns of the capital invested in irrigation schemes seems to Mr. Stabler to have been often exaggerated or referred only to the most favourable conditions possible; consequently it is not generally applicable, nor suitable to average conditions and to farmers of medium capacity. Further, in all districts in which irrigation is begun the prices of produce are much higher during the first years, and an investment of capital based on

the yield and profits of such a period would stand much probability of being a mistake.

Whilst a Government report states that well conducted farms under the rotation: lucerne, cereals, sugarbeets and potatoes, yield per acre 40 to 60 bushels of wheat; 75 to 110 of oats, 50 to 90 of barley, 300 to 500 of potatoes, 15 to 20 tons of sugar-beets and 4 to 6 tons of lucerne, the average yields of the above crops in 9 States of the arid region for which data are available, namely Colorado, Arizona, New Mexico, Wyoming, Utah, Montana, Washington, Oregon and Idaho, according to the last census were only: wheat 24.5 bushels; oats 37.1; barley 24.5; potatoes 144.6 sugarbeets 11.36 tons; lucerne 2.97 tons per acre; and in nine States in the humid region (Indiana, Illinois, Iowa, Wisconsin, Michigan, Minnesota, New York, Maryland, Mississippi) they were: wheat 16 bushels; oats 28 barley 21.6; potatoes 101.2. The figures for sugarbeets are lacking in the statistics. The author sets them down at over 9 tons per acre.

The development of an irrigated farm is always a slower and more costly undertaking than that of one which avails itself only of rainfall, as the former requires perfect levelling of the surface and the erection and upkeep of the irrigation works in addition to the strict farm operations.

The crops obtained by means of irrigation are burdened with the cost of the irrigation works and of the water rights, from which non-irrigated crops are free. This extra cost is partly offset by larger returns per acre, but the profits in turn are often reduced by the distance from market. Therefore this factor in relation to the kind of crops grown must be carefully considered.

The writer estimates as follows some items of the cost of production:

	per acre		
Clearing of sage brush or other plants by drawing a heavy split log or steel rail with a team hitched to each end, across the land . . .	\$	2 to 5	(8s. 3d. to £1 os. 7d.)
Levelling the soil	"	3 to 30	(12s. 4d. to £6 3s. 4d.)
Excavating the supply and distribution ditches and building the accompanying structures . . .	"	2 to 5	(8s. 3d. to £1 os. 7d.)
Cost of applying water to the land	"	1.50 to 3.50	(6s. 2d. to 14s. 5d.)
Average cost of maintenance and supply . . .	"	1.07 to . .	(4s. 5d. to)
Drainage: the cost differs very much. An average may be taken at	"	15.	(£3 1s. 8d.)

The cost of drainage varies so much that it is difficult to estimate an average. It may be said, however, that from experiments made by the Government in reclaiming lands that had been alkalied or waterlogged and bringing them back to their former productiveness the average cost was close to \$15 (£3 1s. 8d.) per acre.

In another Government publication is an estimate of expenses for the first two years' operations on a small irrigated farm in Arizona:

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	\$	£	s	d
7.2 acres at \$100 per acre	720.00	147	19	0
7 and papers	20.00	4	2	2
ling by contract	124.00	25	9	7
ng, head gate, pumps, small two-room cottage and shelter for horses	271.00	55	13	9
, wagon, plough, harrow, garden tools, mowing machine,	615.00	126	7	6
Total preliminary outlay	\$1750.00	£359	12	0

	\$	£	s	d	
year — Cash for seed, water, crates etc.	127.92	26	5	9	
nd year — Cash for seed, water, crates, etc.	226.19	46	9	8	
ovements	59.28	12	3	6	
l labour	72.00	14	15	11	
Total expenses for two years		485.39	99	14	10
Total cost	\$2235.39	£459	6	10	

The following data refer to another farm in a State farther north and so taken from a Government bulletin: "The average cost of the first built on a new farm does not exceed \$450 (£92 9s. 4d.). The barn cost \$200 (£41 2s.) and a shed for tools \$100 (£20 11s.). The necessary such as ploughs, harrows, drills, mowers and binders, together with us, horses, harness, one cow, shovels, forks, and so on, will cost from to \$1500 (£164 8s. to £308 4s.), the average being probably \$1100). To fence 160 acres of land with a four-wire barbed-wire fence, of cedar 40 feet apart, and brackets each 10 ft. apart, will cost \$400 (£82). A capital of \$2500 (about £513) would be sufficient for a set—provided he had enough money in addition to pay the first and second iments on his land and water right. On 160 acres this payment would ge \$550 (£113) per annum." This is at \$30 (£6 3s. 3d.) an acre for and water.

There is no mention above of costs incidental to irrigation, so they given here on an acreage of 80 acres.

	\$	£
First two payments on land and water right	480.00	(98 12s.)
House	450.00	(92 9s.)
Barn	200.00	(41 2s.)
Tool-shed	100.00	(20 11s.)
Implements and stock	1100.00	(226 0s.)
Fencing	200.00	(41 2s.)
Clearing land	240.00	(49 6s.)
levelling	400.00	(82 4s.)
Ditches and structures	240.00	(49 6s.)
Maintenance and supply — water rental—for 2 years	160.00	(32 17s.)
Cost of applying water for 2 years	240.00	(49 6s.)
	\$3810.00	(£782 15s.)

This estimate holds good for Wyoming, Montana, Idaho, or the Dakotas. For a smaller acreage in Colorado, Washington or Oregon the outlay would be the same on account of the higher price of land and water rentals, but of which would be at least double; and in California they would be greatly still.

In the Western States the fifty-five thousand different irrigation enterprises are capable of supplying water to nineteen million acres; of which about six million have not yet been sold.

19 - Availability of Nitrogen in Organic Ammoniates.

- (1) COULSON, T. H. Availability of nitrogen in organic ammoniates. — *The American Fertiliser*, No. 10, Vol. XXXVIII, pp. 44-45. Philadelphia, Nov. 16, 1912.
- (2) STREET, J. P. Note on the neutral permanganate method for the availability of organic nitrogen. — *The Journal of Industrial and Engineering Chemistry*, Vol. 4, pp. 437-438. Easton, Pa., June 1912.
- (3) JONES, C. H. Activity of organic nitrogen as measured by the alkaline permanganate method. — *Ib.*, pp. 438-441.
- (4) HARTWELL, B. L. & FEMBER, F. R. The effect of the « wet process » on the availability of low grade nitrogenous materials. — *Ib.*, pp. 441-443.

The addition of phosphatic manures to organic materials is shown to interfere with the neutral permanganate method for estimating the availability of organic nitrogen; the use of small quantities of sodium carbonate in the process gave very satisfactory results, which agree with those obtained by the alkaline permanganate method. The latter method gives useful information as to the quality of insoluble organic nitrogen in manures, this information being confirmed by vegetable trials.

The following analytical results are given :

1. Nitrogen as nitrates.
2. Nitrogen as ammonium salts.
3. Water-soluble organic nitrogen.
4. « Active » insoluble organic nitrogen (liberated by the alkaline permanganate process).
5. « Inactive » insoluble organic nitrogen.
6. Total nitrogen.

It was found that when the manure is derived from materials of high nitrogen content the figures given under the 4th heading are in comparison with those given under the 5th, whereas when low grade materials have been used in the manufacture, the proportions are reversed. « Active » nitrogen is usually about 70 % of the total insoluble organic nitrogen, while with low grade materials it is 40% or lower.

The nitrogen in certain low grade materials, such as peat, gas tankage, roasted leather, is of a very low availability, but manufacturers claim that treatment by the so-called « wet process » completely changes its chemical and physical nature and materially increases its availability. Samples of such materials were taken before and after the process and yielded on analysis:

	Percentage of total nitrogen	
	Before treatment	After treatment
As ammonium salts,	6.5	14.3
As water-soluble org. matter	7.8	57.7
As water-insoluble org. matter . . .	85.7	28.0

From this the conclusion was drawn that when low grade ammoniates are used for making base goods by the « wet process », a large percentage of the nitrogen is rendered highly available for plant use.

All the above results were the work of a committee appointed by the directors of the Agricultural Experiment Stations of the New England States, New York, and New Jersey to investigate by laboratory methods the availability of organic nitrogen.

o - The Fertilizer Trade in the Netherlands.

Communication from the Netherlands General Direction of Agriculture.

The General Direction of Agriculture, Division VI (Publications and statistics), has compiled expressly the following table concerning the present condition of the production, importation, exportation and consumption of fertilizers in the Netherlands.

Production, importation, exportation, and consumption of fertilizers in the Netherlands in 1910.

Description	Production metric tons	Imports m. t.	Exports m. t.	Total consumption m. t.	Consumption by Co-operative Societies m. t.
Nitrate of soda	—	164 826	107 218	57 608	34 783
Sulphate of ammonia	10 000	31 031	23 473	17 558	3 658
Potash salts	—	175 212	9 597	166 615	94 783
Basic slag	—	195 719	101 578	94 141	76 366
Superphosphates	150 000	—	—	90 000	62 865

To this table, which gives a good idea of the fertilizer trade in the Netherlands, the following information may be added as to the method used in obtaining the above data.

The total consumption of nitrate of soda was calculated by subtracting the amount exported from the quantity imported.

The production of sulphate of ammonia was estimated in 1907 at 10 000 metric tons. In comparing the amount purchased by the co-operative societies with the total consumption, the latter seems too high, perhaps on account of an error in the estimate of the production. In fact, according to communication made to the International Institute of Agriculture by the

"Gemeente Gasfabrieken Hoofdkantoor," the production of the gas factories alone does not exceed 5 293.39 m. t. (1910).

The total consumption of potash salts and of basic slag has been estimated in the same manner as that of nitrate of soda. According to the data of the German "Kalisyndicat," the consumption of potash salts in 1910 was 178 000 m. t.

Some years ago, the annual production of superphosphate was estimated at 120 000 m. t., but a new factory having since been started, the present output may be reckoned at 150 000 m. t. There is a discrepancy in the importation and exportation figures, but this arises from the fact that they include much raw phosphate. Nevertheless, as the total consumption of superphosphate was estimated some years ago at 60 000 m. t., if these figures were correct, 90 000 m. t. is not too high an estimate for the present consumption.

21 - Phosphates and Nitrates in Egypt. Their Importance to European Agriculture.

1. POLIER. La richesse agricole et minérale de l'Égypte. § 3 Les richesses minérales de l'Égypte. 8. Phosphates et Nitrates. — *Bulletin de la Société d'Encouragement pour l'Industrie Nationale*, Vol. 118, No. 2, pp. 232-272 (268-270). Paris, August, September, October 1912.

2. SRUTZER, O. Phosphate, Sonstige Phosphatlagerstätten Afrikas. — *Die Wichtigsten Lagerstätten der "Nicht-Erde"*, First Part, pp. 363-364. Berlin, 1911.

The discovery of large deposits of phosphate and nitrate in Egypt would be a very important matter, not only for Egyptian agriculture since constantly increasing quantities of fertilizers are imported into the country, but also for the European agriculturist, who makes use of enormous amounts of these substances.

Nitrates. These have to be left out of consideration, for though large deposits of nitrate have been discovered in the Nile valley, the high proportion of sodium chloride they contain renders them useless. Further they do not form crystalline masses, but are simply saliferous clays. The result of prospecting seems so far to be negative.

• **Phosphates.** The phosphate deposits, on the other hand, appear likely to be a source of wealth to the country. Their presence has been observed at a large number of places all situated in a zone which, on the west of the Nile, includes the oases of Dakha and Kharga, while on the east it leaves the Nile between Keneh and a point south of Esneh, and stretches to the north-east up to the Red Sea, at Safadja and the west coast of Sinai. Outside this broad band, phosphate deposits have been found in the oasis of Baharia and quite to the south-east of the frontier of Egypt in the valley of Wady Hodein, on the shores of the Red Sea.

The principal known deposits are the following:

1. The first was discovered in the Nile valley 11 miles south of Esneh. A second was found on the plateau called Djebel el Qurm; this is 0.6 to 1.2 miles wide by $5\frac{1}{2}$ long. The nearest station is 6 miles

ant, but connection with the railway could easily be effected. A third post is at Sebahia. The samples taken have yielded 70 % of tribasic sphate.

2. An English Company has obtained concessions at Safadja on the shores of the Red Sea, but as no details of results have been divulged, the probabilities are that they have not been of a satisfactory nature.

3. The richest deposits are without doubt those of Rachid, in the Bah Oasis. They extend throughout the whole length of the latter a distance of at least 31 miles. The average thickness of the workable tum varies from 6 to 10 ft. The bulk of the deposits occurs always on the edge of the desert on the borders of the cultivated land, and their exploitation would be a very easy task. Unfortunately, the Oasis of Bah is in the open Libyan desert 370 miles from the Nile Valley. Recently the railway has been carried as far as the Oasis of Karghan, which is only 93 miles from that of Daklah.

Thus it is at Daklah that the prospects of Egyptian phosphates appear most brilliant. They have not escaped the notice of the Gafsa Sphate Company, who are known to possess a quasi monopoly of trade.

New Methods for determining the Comparative Value of Selected Plants.

HUMMEL, A. Massenbauversuche. — *Illustrierte Landwirtschaftliche Zeitung*, Year 31, Nos. 88 and 89, pp. 821-824 and 829 + figs. 922-924. Berlin, Nov. 4 and 8, 1911.

BILGER, O. Zur Methodik der Sortenprüfung. — *Ib.*, Year 32, No. 91, pp. 827-829 + figs. 898-900. Berlin, Nov. 13, 1912.

Formerly, selected seeds were tested in the laboratory; now on the contrary, experiments made in the field are considered the most satisfactory. This has given rise to the development of comparative cultivation experiments of the new selected varieties, e. g. those carried out by the German Agricultural Society (Deutsche Landwirtschafts Gesellschaft), which have risen in number from 562 in 1905, to 726 in 1911. Of these in the former year and 250 in the latter were devoted to oats.

The principal difficulty in such experiments is the avoidance of experimental errors, which prevent an exact estimation of the productivity of the new varieties. In Denmark and in Sweden, where such experiments are much practised, they are repeated on the same soil for 3 to 8 years in succession. The new method proposed by Hummel, named by him the "compensation method" has the advantage of giving more immediate results, and consists essentially in the two following conditions:

1) Take the arithmetical mean of the results in absolute figures for every variety; to this, taken as 100, the results obtained from every plot of the same variety are referred, and thus all the results are given in percentages of the arithmetical mean for every variety submitted to experiment.

2) Take successive groups of 9 contiguous plots forming a 3 square, find for each group the arithmetical mean of the results referred to 100 as above; the difference between this figure and 100 represents mean deviation of the square from the average of the whole experimental field. Then add this amount to the figure of the central plot, or subtract it, according as to whether it is negative or positive, and repeat operation for all the plots.

The percentages thus corrected are recalculated in absolute figures and to these the calculation of the probable errors is applied by means of the formula:

$$\frac{\Sigma \pm d \cdot 0.845}{\sqrt{n \cdot (n - 1)} \cdot \sqrt{n}}$$

— where Σ is the sum of the separate results, d the difference between the separate results and the average, and n the number of the plot in every variety, 0.845 being a constant.

Now, calculating the probable error (by means of such a formula in the direct experimental data and that in the data obtained by proposed method, it will be found that this last is less.

In fact, in the practical case of the two comparative experiments made with 30 varieties of beans in a series of 6 lots and with 20 varieties of rape in a series of 5 lots, the probable average error for the first experiment was reduced respectively from ± 9.19 to ± 6.90 and ± 4.48 to ± 3.54 in percentage of the average.

In conclusion, the advantages of the new method proposed would be:

I. By means of the "compensation" calculation, part of the experimental errors which are inherent in comparative cultivation experiments are eliminated, and the sources of error are thus limited to those dependent on the separate lots.

II. Such errors as cannot thus be eliminated, are expressed in figures; thus the results can be subjected to mathematical criticism.

III. Selection having for its object the increase in the yield of cultivated plants, is thus placed upon a surer and more fitting basis.

23 - Cultural Bud Mutations of *Solanum immitis* Dunal.

HECKER, ED. Mutation gemmaire culturale du *Solanum immitis*, Dunal. — *Rendus de l'Académie des Sciences*, Vol. 155, No. 18, pp. 804-806. Paris, Oct. 28, 1912.

After referring to his previous researches on the mutations of *Solanum tuberosum* L., a species growing wild in Bolivia and Peru, the writer gives the results he obtained with *Solanum immitis* Dunal, which was brought by M. Verne from Chancay (north of Lima, Peru), the classic habitat of this species. In Chancay a complete mutation of the tubers and all the subterranean portions of the plants was obtained although the tubers had only attained a slight degree of development (10 to 12 gr. maximum); further, the productivity of the plant appears previously to be very small, for two specimens only bore 3 tubers.

however showed mutations. The writer did not consider the arguments for making *Solanum immite* a separate species sufficiently convincing, and after having cultivated it a long time, he believes it should be regarded as identical with *S. tuberosum* L.

Its behaviour under cultivation (intensive fertilizing) as regards the production of its tubers, shows other points of similarity with *S. tuberosum*. The mutation found in the latter occurred in one year, and this is the first time that M. Heckel has observed such a rapid change, whereas at the same time far-reaching, affecting the various parts of the tubers and the stolons, which are very plentiful in the wild plant. In other cases, the mutation was slower, and attended by greater difficulties; sometimes in fact it did not occur (*Solanum Comersoni* and *Maglia*). The fact of the rapidity of mutation in the tubers in the *S. tuberosum* and in *S. immite* Dunal perhaps explains the classic mutation of all cultural varieties to the wild *S. tuberosum* L. of Peru. This variety has no doubt accommodated itself to cultivation and to the production of edible tubers more readily than other wild species, so quickly that it has been given the preference in cultivation over other kinds.

Since it has given rise to a mutation, it appears to produce varieties, and to have tubers of different colours and shapes. This will be seen in the next season, in which all the tubers, both mutated and non-mutated, of the crop of 1912 will be used.

The writer obtained mutation in *S. Maglia* and *S. Comersoni* under conditions which show the slowness and the difficulty of this change. No mutations have so far occurred in the tubers of *S. Jamesii* Lamour., which has been cultivated for three years.

Solanum immite, a New Species of Potato from Peru.

NEUMOSTIER, CHARLES. Le *Solanum immite*, nouvelle espèce de Pomme de terre tubéreuse du Pérou. — *Annales de Gembloux*, Year 22, Part II, pp. 621-624, 6 plates. Bruxelles, Nov. 1, 1912.

r. N. Esporto, Botanical Assistant at the National Agricultural and Veterinary School at Lima, found in the lomas (x) of Pasamayo, prov. of Arequipa, from 1906-1907, the species of *Solanum* which has a tuberous root and which had been found for the first time about 1790 by Humboldt, and been preserved in de Boissier's herbarium. It was determined by Neumostier, who gave it the name of *S. immite* and considered it to be a new species. This *Solanum* was much sought after by the Peruvian farmers especially and it was regarded with interest as the possible ancestor of a new edible potato.

Selection and improvement experiments were carried out on this species at the Lima School and the results obtained showed that the tubers (weight and size) were capable of improvement.

x Lomas = winter pastures on the high parts of the spurs of the Andes.

Its nutritive proprieties (at any rate as a feed for animals) are undoubtedly judged by the eagerness of the pigs which are turned out in "loma" during the winter season.

The tubers were placed in pots in April 1910; their weight varied from 0.5 to 5 grams. In September, about 300 tubers were harvested; their weight was from 0.5 gr. to 30 gr.

These were carefully preserved and planted in 1911, after having been classified according to size. They were planted in soil which had not been fertilized for a long time and where mulberry trees had grown for the last 5 years.

It was desired to obtain for 1911, a series of complete plants from which a first supply of tubers to be intensively cultivated with suitable manure could be picked out. Forty-five plants were separated out of which the yield and vegetative characters were well known and which will form the point of departure of new selection experiments. The following figures give an idea of the first crops obtained.

The field was divided into six lots, of which three of 6 ft. 6 in. \times 13 ft. were planted with the larger tubers. The crops were respectively 4.73 lbs., 5.03 lbs. and 9.41 lbs., with an average weight per plant of 113.127.161, and 129.670 grams, while the average yield of the wild *S. im* was only from 21 to 25 grams.

Plot IV (6 ft. 6 in. \times 13 ft.) yielded 5.47 lbs.; plot V (6 ft. 6 in. \times 13 ft.) yielded 6.79 lbs.; the number of plants was not accurately known. Plot VI (13 ft. \times 13 ft.) produced 23.52 lbs. The following are some yields of separate plants; the weight is given in grammes:

173.10; 171.10; 180.60; 186.90; 192.50; 197.50; 206.20; 218.20; 232.40.50; 280.40; 283.25; 311.75; 429.35; 460.80; 548.31; 667.45.

The writer calls special attention to the plant which had a yield of 548.31 gr.; the rhizomes were superficially arranged, several of the neighbouring tubers were disposed in a parallel manner and belonged to different chains, of which four could be distinguished. It was observed that this plant possessed two well-developed stems above ground.

25 - Recent Scientific Investigations Described in the First Collective Report of the Experiment Station for Cereal-Testing.

Wissenschaftliche Neuforschungen aus dem Ersten Sammelbericht der Versuchsanstalt Getreideverarbeitung. pp. 206-210. Berlin, 1911.

A. Characteristics of German Cereals. Bread-making properties of rye and wheat meal.

I. Rye. The dough and bread-making properties of the 13 samples of rye examined (12 Petkuser and 1 Probesteier) were found to be excellent and to fulfil adequately all the technical requirements. Average yield was ascertained to be 155-158 grams, and bread-yield 138-149 gr. per 100 grs. of flour. The volume of the bread should be 300 cc. per 100 air-dry flour, or at least, not fall far below this figure.

II. Wheat. The extensive data resulting from the examination of varieties of wheat showed that local varieties were much superior to

sively selected ones in bread-making properties, while very inferior in yield. Usually, good baking local wheats have the higher gluten content. When mixed with other wheats, the selected highly productive varieties lose their defective properties and generally produce flour and bread of good colour.

Statistical estimate:

	Gluten		Dough yield ^a	Volume
	damp	dry		
First grinding	32.0	10.1	162-163	376
Second grinding	33.7	11.1		420

The gluten content of the first grinding is usually 1 % lower than that of the second grinding, but the gluten of the first is softer, less firm, and has a greater power of taking up water.

Further, flour of 21 varieties of winter and 12 of spring wheat were examined.

Average of factors determined:

	Gluten		Dough yield	Volume	
	damp	dry		Household bread	Fancy bread
Winter wheat	30.0	10.0	170	415	390
Spring wheat	36.0	11.9	172	437	407

There is without doubt a certain relation between the amount of gluten present and the volume of the bread: a very low gluten content produces loaves of small volume, while the largest loaves are usually the result of using a flour which is rich in gluten.

The gluten content appears to show no parallelism with the quality of the bread.

B. Characteristics of some foreign wheats.

The North American wheats are distinguished by short firm gluten, and the bread made from them alone is inferior in quality; they are, however, very suitable for mixing with tenacious and soft wheats. The South American wheats have usually very extensible, soft gluten and the flour and bread made from them are soft and have a large volume, but the dough tends to be deficient in elasticity.

	Gluten		Amount of dough	Volume	
	damp	dry		Household bread	Fancy bread
Average	40.4	12.9	271	427	408

C. Nitrogen content and distribution in native wheats.

Experiment showed that there was no close connection between the nitrogenous substances of different degrees of solubility and the quality of the flour. There seems, however, to be a connection between the constitution of the gluten and the amount of alcohol-soluble portion of protein.

for firm short gluten contains less of the soluble part than does soft extensive gluten, but the behaviour of the flour, as a whole, does not depend upon the alcohol-soluble protein.

Protein which is soluble in water is also of no importance in estimating the quality of wheat flour.

D. *The Effect of manure on the composition and kneading properties of rye and of wheat.*

1. The use of chemical fertilizers as a rule slightly increases the weight per bushel; and potash fertilizers in no way injure this quality of the wheat.
2. There appears to be no clear relation between the weight per 100 grains and the use of a fertilizer.
3. Complete manuring generally produces an increase in protein.
4. The ash content is not made higher.
5. The fat content remains the same.
6. The hydrocarbons, which behave in an almost opposite manner to protein, decrease slightly.

There is no regular connection between the amount of flour and the use of fertilizers.

Baking experiments showed, that the qualities distinguishing good flour: amount of dough, and the weight and volume of the loaves, are not affected by a complete fertilizer, at least in the case of rye. No satisfactory decision has been arrived at with regard to wheat, as the experiments made have been few and not extensive.

26 - Comparative Experiments in Barley Cultivation.

VARGA KALMAN. *Összehasonlító árpatermesztéskísérletek. Közlök, Year 22, No. 8, pp. 3051-3052. Budapest, November 16, 1912.*

In Hungary, the value of brewing barley depends much on the date of its ripening, and therefore it is a mistake to introduce barleys from northern countries, which are late and usually shrivel during the great heat in July and become useless in the manufacture of beer.

Three years ago, the idea spread that "Hofbräu", "Golden melon", and "Probstei" varieties could be compared to "Hanna", which is especially suitable to Hungary.

From 1909 to 1911, the writer made a series of comparative experiments with the above-named varieties in order to ascertain: 1) the precise date of their ripening, 2) the influence exercised upon their quality by the application of nitrate, used with or without superphosphate. The experiments were carried out on plots belonging to the Agricultural Academy of Kassa in North Hungary, on deep and fairly heavy soil.

The barley always followed potatoes and the treatment of the soil was identical in both cases.

The data obtained respecting the average date of ripening are given in Table I.*

Varieties	Date of sowing		Date of germination		Date of tillering		Date of earing		Date of ripening						
	1909	1910	1909	1910	1909	1910	1909	1910	1909	1910					
Probleti	IV / 4.	III / 25.	IV / 7.	IV / 18.	IV / 3.	IV / 21.	V / 8.	V / 12.	V / 4.	VI / 6.	VI / 12.	VI / 15.	VII / 19.	VII / 20.	VII / 26.
Golden-Melon	IV / 4.	III / 25.	IV / 7.	IV / 20.	IV / 12.	IV / 23.	V / 10.	V / 12.	V / 16.	VI / 10.	VI / 14.	VI / 16.	VII / 19.	VII / 22.	VII / 28.
Hofbräu	IV / 4.	III / 25.	IV / 7.	IV / 22.	IV / 11.	IV / 24.	V / 8.	V / 16.	V / 18.	VI / 13.	VI / 16.	VI / 12.	VII / 25.	VII / 26.	VII / 28.
Hanna	IV / 4.	III / 25.	IV / 7.	IV / 18.	IV / 3.	IV / 21.	V / 5.	V / 4.	V / 10.	VI / 5.	VI / 11.	VI / 7.	VII / 13.	VII / 18.	VII / 22.

TABLE II.

Varieties	Fertilizer used per acre	Average yields in 1909, 1910, 1911				Average percentage of protein	Average weight
		Average weight per 10 shocks		lbs. per acre			
		Grain	Straw	Grain	Straw		
Hofbräu	No fertilizer . .	lbs 5 291.09	lbs 8 157.09	1 332.80	1 551.36	10.66	5
	93 lbs nitrate . .	5 621.78	8 598.02	1 271.24	2 718.48	12.85	5
	232 lbs superphosphate	5 401.32	8 377.56	1 488.02	2 856.04	10.70	5
	232 lbs superphosphate	"	"	"	"	"	"
	93 lbs nitrate . .	6 062.71	8 598.02	1 643.25	2 418.48	10.80	5
Probstei . .	No fertilizer . .	6 613.86	11 243.56	1 550.47	2 852.04	11.20	5
	93 lbs nitrate . .	7 054.78	11 125.41	1 828.81	2 868.10	12.80	5
	232 lbs superphosphate	7 165.02	11 904.95	1 844.86	2 914.49	11.00	5
	232 lbs superphosphate	"	"	"	"	"	"
	93 lbs nitrate . .	7 275.25	11 904.95	1 736.03	2 944.82	11.30	5
Golden-Melon	No fertilizer . .	5 291.09	7 275.25	1 488.02	1 519.25	10.50	
	93 lbs nitrate . .	6 172.94	8 377.56	1 736.03	1 565.64	13.10	
	232 lbs superphosphate	6 062.71	7 716.17	1 704.80	1 550.47	11.80	
	232 lbs superphosphate	"	"	"	"	"	"
	93 lbs nitrate . .	6 613.86	7 826.40	1 860.03	1 828.81	11.80	
Hanna . . .	No fertilizer . .	5 952.47	7 716.17	1 674.47	2 015.25	9.80	
	93 lbs nitrate . .	6 062.71	8 598.02	1 704.80	2 015.25	10.20	
	232 lbs superphosphate	6 724.09	7 936.63	1 844.86	2 480.04	9.90	
	232 lbs superphosphate	"	"	"	"	"	"
	93 lbs nitrate . .	7 826.40	9 038.94	1 891.25	2 464.87	9.85	

It will be seen by this table that the "Hanna" variety is the earliest, it comes "Probstei" and "Golden Melon", which can also be cultivated in this part of Hungary, but "Hofbräu" is too late to be grown fitably.

The comparative experiments in cultivation and manuring are given in Table II.

It will be seen from this table, that the yields were increased by the use of fertilizers, that a nitrogenous fertilizer increased the protein content of good brewery barley should not contain more than 9 per cent of protein) but that nitrate is only injurious in this respect if by means of the application of this fertilizer, the soil contains an excess of nitrogen in proportion to the potash and phosphoric acid present. Nitrate used alone increases protein content 1.69 per cent, if superphosphate is applied at the same time, the increase is only 0.39 per cent.

Rice Culture in the Philippines.

CONNOR, CHAS. M. and MACKIE, D. B. *Government of the Philippine Islands, Department of Public Instruction, Bureau of Agriculture, Bulletin No. 22, pp. 40 + XXII plates. Manila, 1912.*

In the Philippine Islands during the fiscal year 1911, 1 043 757 hectares (2 579 228 acres) of land were cultivated in rice, producing 794.13 metric tons (1 945 677 976 lbs) of rough rice (palay). The area cultivated in rice is 94.5 per cent of the total areas cultivated in abacá (*Manihot*), coconuts, sugar, corn, and tobacco. The crop is valued \$6 220 755 (\$ 30 897 795) representing 65.9 per cent of the total value of the above named crops. Counting the population at 8 886 314 there is one hectare (2.47 acres) of rice cultivated to every 8.5 persons.

The following table shows the area cultivated, total yield, and average yield, and average yield per hectare.

Table No. 1. Rice Crop in the Philippine Islands.

Year	Total area cultivated (hectares)	Total amount of rough rice produced		Average per hectare	
		Metric tons	Equivalent in cavans (1)	Kilos	Equivalent in cavans (1)
1909	1 156 105	747 942.69	17 394 016	646.95	15.05
1910	1 192 141	810 940.70	18 859 086	680.24	15.82
1911	1 043 757	882 794.13	20 530 096	845.49	19.67

1) The people throughout the country measure rice by the cavan, the average of which is 43 kilos (94.6 lbs) for rough rice (palay) and 57.5 kilos (126.5 lbs) for 1 rice.

Rice seems to grow well on almost any of the different types of soil. The only essentials are that the soil be fairly fertile and that there be a layer of impervious clay beneath.

At the present time the great majority of rice growers depend upon rain water for growing their crop. As a rule only one rice crop is grown which is planted at the beginning of the rainy season. The rice-growing provinces may be divided into two groups, those that have a pronounced wet and dry season, and those that have their rainfall distributed more or less throughout the year. Most of the former are located within the Plain of Luzon; and the latter are near the Pacific coast towards the south. It is estimated that it takes at least 100 to 150 hectare-centimeters of water to grow a normal rice crop, provided it is evenly distributed over the growing season. The average rainfall during the five rice-growing months (June-October) in those provinces having a pronounced wet and dry season is 1556 millimeters. In such localities irrigation is destined to play a great part in rice growing: firstly because rice can be planted at the best time for its development, and secondly two crops may be grown each season.

About 50 587 hectares (125 056 acres) are now under irrigation; 485 640 hectares (1 200 065 acres) may be easily brought under modern irrigation. This work is going forward rapidly.

About four-fifths of the rice grown is transplanted. One-twentieth of the area to be planted is required for the seed bed. In some sections where water is less scarce two crops of rice are grown each year, the second or short-season crop is sown broadcast.

Weeds and grass do not give much trouble in those sections where there is a pronounced dry season and where irrigation water is not available. The rice is harvested about the close of the rainy season and the fields are used for pasture during the rest of the dry season.

Cases may be cited where large areas have been grown in rice for at least one hundred years and still produce good crops without the use of fertilisers.

Upland rice is sown on the hills and, as a rule, on new land. The rainfall is depended upon for moisture. The rate of seeding is about 64.5 kg. per ha. (57.6 lbs per acre). The average yield from upland is not more than one-half that of transplanted rice, nor is the quality considered as good. If the stand is not even, weeds and grass give considerable trouble. The same varieties may be used for this method for the *cañgin* method; this consists in burning the underbrush and trees on the hills and sowing the rice in holes, without ploughing, when the rains begin; the land is not planted a second time but allowed to cover itself with young growth for three or four years when it may be cut over and used again. Crops of rice grown in this way may exceed in yield crops grown in the regular way.

There are a few localities where a short rotation is practiced, for example, in sections of Tarlac and Pampanga sugar cane is rotated with rice. In some parts of Laguna and Batangas corn is rotated with

good advantage. In many sections mungos are planted on the rice lands during the dry season.

The following is the estimated cost of production of 1 hectare (7 acres) of rice according to 230 answers to an enquiry made by Board of Agriculture.

Estimated cost of 1 hectare,

Preparation of seed bed	P. 2.25
One cavan of seed (when sown broadcast 1 $\frac{3}{4}$ cavans)	2.50
Plowing one hectare — one man and carabao (1) 10 days at P. 1.25 per day	12.50
Harrowing and putting in order for transplanting: one man and carabao eight days at P. 1.25 per day	10.00
Transplanting: twenty women and children at P. 0.40 per day	8.00
Cost of harvesting and threshing	21.50
Total estimated cost P. 56.45 (2)	

When the crop is harvested on shares, the harvesters get from one-tenth to one-fifth, depending upon the condition of the crop, but the average seems to be one-fifth.

When the land is rented and the farmer has his own work animals, etc., the owner of the land gets from one-third to one-half the crop. If the owner of the land furnishes the animals, plows, etc., the farmer gets one-fourth.

Threshing is still done in most localities by tramping out with the flail, or tramping with carabaos. However, steam threshers are being used more generally each year in the large rice-growing districts.

One hundred kilos rough rice, or palay, will give about 65 kilos of cleaned rice. Much of the rice that is used locally is cleaned by pounding in a large wooden mortar. But there are a number of large rice mills in the Islands properly equipped for making good marketable rice. There are also some two hundred and fifty small mills requiring engines of 8 horse power to operate, which clean rice for local use. There are only two grades of by-products: "binlid" or broken rice and "ti-tiqui" or rice bran.

Of the 910 varieties of rice collected by the Bureau of Agriculture in the Philippine Islands, 452 were found to be lowland and 458 upland; 14 of the lowland and 6 of the upland were bearded. The detailed results of variety tests are shown in a number of tables. The earliest variety matures in 118 days; the latest in 209 days.

Except for making the planting and harvest fit in with the average weather conditions there is no occasion for growing a variety that takes more than 150 days to mature.

¹ Buffalo of the Malay Archipelago.

² P. = \$ 0.5 = 2s 0.16d.

The average yields of the lowland varieties tested were as follows

White, non-glutinous, beardless varieties :

33 or 20.6 % gave less than 1000 kilos of palay per hectare.
 58 " 36.2 " ranged between 1000 and 2000 kilos of palay per hectare.
 69 " 43.1 " " " 2000 " 3400 " " " " "

White, non-glutinous, bearded varieties :

5 or 4 % gave less than 1000 kilos per hectare.
 66 " 53.6 " ranged between 1000 and 2000 kg. per ha.
 52 " 42.3 " " " 2000 " 2800 kg. per ha.

Red, non-glutinous, beardless varieties :

6 or 12.7 % gave less than 1000 kg. per hectare.
 19 " 40.4 " ranged between 1000 and 2000 kg. per ha.
 22 " 40.8 " " " 2000 " 3000 kg. per ha.

Four hundred and fifty-eight upland varieties were tested; data relative to 25 of them are tabulated. The earliest of these mature in 126 days; the latest in 141; the yields varied from 2665 to 4100 kilos of rough rice (palay) per hectare, being, on the average, higher than those for lowland. One explanation for the short range in the ripening period of the upland varieties is that they tend to mature as soon as the rains stop. Four varieties were found which have the grains arranged in bunches of three, much after the fashion of wheat, which is rather unusual. Unfortunately all of these have very dark or black grains which render them unfit for general use.

Rice pests. Rats have been the most numerous and destructive of the pests. Four distinct species have been found, a large brown rat, probably *Epmys norvegicus* Erxleben, being the most numerous.

Birds. — In some districts seed-eating birds often are very destructive, the "mayas" *Munia jagori* Martens, and *Uroloncha everetti* Tweed (Ploceidae) being the most numerous. Two ducks, *Anas luxonica* Frass and *Dendrocygna arcuata* Horsf., are also destructive; the former seem to prefer fresh water streams and the latter the salt water "esteros".

Insects. — The rice is subject to the attacks of: 1) locusts; 2) moth borers spending the larval stage within the stem (*Schoenobius punctellus* Zell. and perhaps other species); 3) rice-worm (*Spodoptera mauritia* Boisd.), often parasitized and held in check by Tachina flies; 4) rice butterflies (*Melanitis ismene* Cram., — a Nymphalid, and an undetermined species of Hesperid) feeding upon the leaves of the growing rice; 5) rice bug (*Leptocoris acuta* Germ.) sucking the juice from the ripening grain; 6) rice weevil (*Calandra oryzae*) often found in stored palay and also crawling about on the ripening heads of grain.

Fungi. — A smut, identified by Merrill as *Ustilago virens*, has been found on upland rice at Lamao, Bataan Province. Another species very much like *Ustilago virens*, but with brown or sooty spores, was noted by Mr. D. B. Mackie on rice growing on Catanduanes Island. Rusts have been reported from various sections, but they rarely do any damage.

- The Branching Habits of Egyptian Cotton (I).

Mc LACHLAN, ARBYLE: *U. S. Department of Agriculture. Bureau of Plant Industry, Bulletin No. 249, pp. 28 + 3 plates. Washington, 1912.*

The excessively large size of the vegetative branches or limbs on Egyptian cotton plants grown under irrigation in the Colorado River Valley in Arizona and California occasions difficulties in cultivation and harvesting, and causes the development of normal fruiting branches to be postponed. To place the growing of Egyptian cotton in the Southwest on a practical basis, cultural control of the production and development of vegetative and fruiting branches must be established. A study of the branching habits of Egyptian cotton is necessary as a preliminary investigation of this problem.

The present paper gives the results of investigations of the branching habits of Egyptian cotton carried out in Arizona and in Colorado during the seasons of 1909 and 1910. The following conclusions are reached:

"The Egyptian cotton plant bears two kinds of branches, long vegetative branches on the lower part of the stem, which bear no flower buds directly, and above these, to the top of the plant, shorter fruiting branches which bear flower buds.

The differences between vegetative branches and fruiting branches are very sharp: 1) Vegetative branches usually approximate the length of the main stem, while fruiting branches are about one-third as long. Vegetative branches bear no flower buds except as they produce secondary fruiting branches. Fruiting branches bear a flower bud at each node opposite the leaf. 3) The vegetative branches, like the axis, bear vegetative branches and may bear fruiting branches. The fruiting branches rarely bear fruiting or vegetative branches.

Vegetative branches may be either axillary or extra-axillary. Normal fruiting branches are always extra-axillary. Single bolls or short fruiting branches are sometimes developed from buds in the axillary position, at nodes bearing fruiting branches. Such branches may be regarded as secondary fruiting branches borne by the axillary vegetative branch, which is itself suppressed.

From 6 to 8 vegetative branches are usually produced from the first nodes of the axis. At the next 2 or 3 nodes the buds frequently remain dormant or are abortive, and above these a fruiting branch is produced at each node. Under conditions of great luxuriance extra-axillary bolls occur at some of the lower nodes which would bear fruiting branches if the development of limbs was restricted. The length and number of vegetative branches largely determine whether the plants are bushy, spreading or upright. The control of the production of vegetative branches—that is, of the stature of the plant—is necessary because of the desirability of small plants in cultivation and harvesting.

Egyptian cotton when planted late apparently develops more num-

(1) See No. 497 B. March 1912.

(Ed.).

erous vegetative branches than when planted early. Early planting is therefore advisable as a means of restricting the development of vegetative branches.

Abortion of early fruiting branches on both axis and large limbs is common in a greater or less degree to all stocks grown from imported seed. Even the Arizona acclimatized plants frequently abort their lower fruiting branches. Some of the selected acclimatized types of Egyptian cotton originated in the United States bear fruiting branches at lower nodes on the stem than the stocks of imported Egyptian cotton. Selection for low fruiting gives promise of being a practical means of increasing earliness and yield. Of the six Egyptian varieties grown in Arizona in 1909 from imported seed, Nubary most nearly resembled the acclimatized stocks in putting out fruiting branches at comparatively low nodes of the stem.

A method of recording branching habits of cotton by means of diagrams has been devised (Reference to the original publication is made for description of them). The diagrams show the location of branches, the development of fruiting branches, and the stature of plants. Such diagrams promise to be of value as records in the cultural and breeding study of cotton.

Preliminary experiments in «topping» young plants have resulted in stimulating the growth of buds in the axils of cotyledons. Branches just below the point where the plant is topped make an excessive vegetative growth and tend to assume an upright position in place of the severed axis. The topping of nearly mature plants to hasten the ripening of fruit has not yet been adequately tested.

Egyptian cotton plants grown on soil containing a considerable quantity of alkali restrict the development of limbs and reject their early fruiting branches.

Differences in the branching habits of the different Egyptian varieties grown from imported seed are not sharply defined, because of the diversity within each variety, and hence cannot at present be used to distinguish one variety from another.

29 - Cultivation Experiments with Dried Seeds of Sugar-Beets in Hungary

JANESÓ, B. Anbauversuche mit vorgetrocknetem Zuckerrübensamen in Ungarn. - Oester.-Ungar. Zeitschrift für Zuckerindustrie und Landwirtschaft, Year XL, 1, Part 1, pp. 691-697. Wien, 1912.

Hastening the first developmental stage of the sugar-beet is now recommended as the best protective measure against the attack of root rot, and to attain this end, different methods are adopted, such as husking, previous soaking of the seeds, manuring the rows, and finally, drying the seeds before sowing.

The last treatment is recommended by D. Hegy, Director of the Royal Hungarian Experiment Station for Vegetable Pathology and Physiology at Magyaróvár. The preliminary experiments in the laboratory showed that drying the beet-seeds had the effect of hastening the ger-

ination and the first developmental stage of the beets; therefore the Royal Hungarian Agricultural Experiment Station of Magyaróvár, together with the above-mentioned station, determined in 1911 to induce practical agriculturists to make experiments with dried seeds of sugar-beet. Two varieties of Kleinwanzleben from different sources were selected. The half of both varieties of seed was dried at 45°C. until the original water content was decreased from 14 or 15 per cent to 8 per cent. The other half of the seeds served as a control and was not treated before sowing.

The drying process improved the germination properties of both varieties; of 100 "seeds" 83 undried seeds germinated, giving 183 seedlings, while 87 dried seeds germinated, producing 213 seedlings. The second experiment: of 100 undried seeds, 91 germinated with 220 seedlings, and of 100 dried seeds, 96 produced 275 seedlings.

The experiment with dried and undried seeds was carried out on 48 farms in Hungary in parallel strips each of at least about half an acre. The opinion of the experimenters was not unanimous. In 14 cases out of the 32 experiments on which reports were sent in, the effect of drying the seed was favourable, and only in one case did this treatment have an injurious action on the development of the plant. In the 17 other cases no special effect on germination was produced by drying the seed, not even where root-rot made its appearance.

The yield was ascertained on 30 of the separate experiment plots. The topped beets per acre were on an average as follows:

I. Undried seeds	264.9 cwt.
Dried "	272.1 "
II. Undried "	276.9 "
Dried "	283.3 "

The sugar content of the beets was tested, but there was no decided consequent difference between the beets grown from dried or undried seed.

Although the above experiments, which only lasted for one year, gave no decisive result as to the efficacy of drying beet-seed, they show that, under certain conditions, intensive drying of the seeds can have an accelerating effect on their germination and the development of the plants. In order to obtain still further light on the question, the experiments will be continued by the Experiment Station.

- A Contribution to the Question of Changes Occurring in Sugar Beets during Storage.

FRIEDL, GUSTAV. Ein Beitrag zur Frage der Veränderung der Zuckerrübe während der Aufbewahrung. — *Oesterreichisch-Ungarische Zeitschrift für Zuckerindustrie und Landwirtschaft*, Year XLII, Part 5, pp. 698-712. Wien, 1912.

Theoretical investigation has already often occupied itself with the question of the changes which sugar beets undergo in store. Most of

the researches, however, dealt solely with the sugar, and the other substances were neglected; but it is just these dangerous producers of molasses, which play a large part in sugar-manufacture. In order to investigate this matter, in the autumn of 1910, sugar-beets were collected and stored in clamps on the experimental field of the Experiment Station of Magyaróvár in such a manner that weekly samples could be taken for the purposes of analysis.

The writer gives in tables the results of this experiment. Other tables give data relating chiefly to the weight, amount of sugar, and quotient, which have been supplied by Hungarian sugar-factories. Reference is also made in this paper to the works of Proskowetz, Marek, and Bruckner dealing with the decrease in sugar content during the storage period, and the writer gives the following summary of his own investigations:

It must be considered as an established fact, that the sugar content of beets decreases greatly during the time the latter are in the clamps.

A portion of this apparent relative decrease is due to the large amount of water which is taken up, causing the juice to become diluted.

The absolute, or real, sugar loss is brought about by the respiration processes of the living roots.

This loss can be avoided through interrupting the vital activities of the beets, which may be effected either by allowing them to freeze, or by drying them. These methods can naturally not be adopted by the manufacturer and recourse must be had to a different kind of clamp. The sort to be preferred is one which with the least means will keep the roots at the lowest possible temperature. The loss of saccharose by means of respiration is caused by the formation of invertose as an intermediate product. The formation of the invert sugar is however a very lengthy process, but nevertheless, is more rapid than its consumption by respiration, thus in time it accumulates. The intensity of respiration depends entirely upon individual properties, but it is also influenced by external influences like temperature and the supply of air.

The stability of the nitrogenous compound is a great contrast to the instability of the saccharose. Until the late spring, the total nitrogen content suffers no absolute diminution. At the end of the storing time the albuminous compounds alone split up into simples bodies. This fact has an unfavourable action on the ratio between sugar and molasses, and the quotient sinks.

The glutamin present seems chiefly to have increased, from which it may be deduced that beet albumen is rich in glutamic acid. The glutamin present in the autumn does not change into glutamic acid, though a similar alteration was stated by Scheibler to occur in the case of asparagin.

No noticeable difference was found in the autumn and spring betain content.

1 - Rubber in Casamance, Senegal

ERRASSE, Le Caoutchouc en Casamance, Senegal. — *L'Agriculture pratique des pays chauds*, Year 12, Nos. 114 and 115, pp. 231-238 and 310 and 315. Paris, Sept-Oct., 1912.

Casamance, which is a long strip of land bordered by Gambia on the north and Portuguese Guinea on the south, is especially rich in lianas and other rubber yielding plants. Rubber is one of the chief articles of export from Senegal, which country exported in 1910, 737,726 lbs. of this product, worth about £87,000. Senegal may be divided into two districts as regards rubber production: Senegal, properly so-called, i. e. the district between the river of that name and the frontier north of British Gambia, which produces and exports principally pea-nuts; and Casamance, where rubber is most produced and exported.

The exportation of rubber, which from 1895 to 1905 rose from 10,010 lbs. to 883,656 lbs., has decreased during the last few years, and the writer has set himself the task of investigating the possibilities of attaining the present important position occupied by rubber in the trade of the country. To this end, he sets forth the present conditions of its production.

I. Rubber from wild lianas.

Although some small plantations of rubber trees exist, it may be said that all the rubber exported at the present time comes from the wild lianas, which grow in nearly all the forests of Casamance.

They belong to the genus *Landolphia* and the most common species is *Landolphia florida* which, however, is neglected by the natives on account of the inferior quality of its rubber. This plant is known to the Europeans under the name of «false rubber liana» and to the natives as «nad», «mantianpo», and «foufoufole». The Casamance rubber is furnished by *Landolphia Heudelotii*, *L. senegalensis* and *L. tomentosa*; the latter seems to be preferred by the extractors, and is called «toll», «tolè», or «torè».

These lianas are not found now, as formerly, in all the forest. They have disappeared before the knife of the «manjacque» or rubber collector, and there remain only three large rubber districts, those of Baxte, Balante and Fogny. Until lately, the natives extracted little rubber from them, but they were very particular, that no stranger should come and tap their trees and thus these stands have been preserved.

Collection of the latex. — The latex has only lately been collected by the natives of Casamance, and hitherto only by those of British Gambia and Portuguese Guinea, the «Akus» and the «Mandiasos» or «Manjacques». The first are intelligent and careful; they usually tap the lianas and obtain, by means of coagulation with lemon juice, a very pure rubber, which is now little found in Casamance, «aku prima», known on the European markets, by the name of A. P. The second are careless, quarrelsome and overbearing, they care nothing for the preservation of the lianas or for the production of first quality rubber, and the natives are obliged to defend themselves against these invaders and

to proceed themselves to obtain the rubber. They tap the lianas by means of incisions, which are made too close together and, coagulate the latex at once by watering the incisions with salt water, with which they also wash the wounds made on the lianas. The rubber thus presents the appearance of large drops, or more or less elongated filaments which the Manjacques roll into a ball. In the evening, they plunge this into water, or place it under ground; next day, it is taken out and fresh rubber added to it till it reaches the required weight. Then some rubber is rendered soft by means of putting it into boiling water and fashioning it into bands of some centimetres in width, which the native rolls round his ball and which give it the appearance of having been made entirely in this way. The ball is again plunged into water, where it remains until it is sold to the trader, who receives it dripping and still retaining its pink colour.

The aborigines adopt much the same method as the « Manjacques », and it is difficult to say which prepares the rubber best.

The cost price of tapping is calculated by reckoning that a man collects 26 to 33 lbs. of rubber per month, i. e. about 1 lb. per day. Experience has shown, that at the time when the liana is distended with sap, a Manjacque can without much difficulty obtain 2.2 lb. of rubber a day, but during the bad season he can only get 9 to 13 lb. per month.

Preservation of rubber and trade.

The rubber obtained is preserved in water or in the ground till the time of sale, which is thus deferred till the fall in price is over. Before accepting the rubber, the trader cuts the balls into two or four pieces to assure himself that they do not contain sand or earth. The purchaser puts the rubber once more into salt water, where it remains till it is exported, when the rubber is packed in casks while still damp. This method of preserving rubber is peculiar to Casamance and influences the price of the product; in Portuguese Guinea, on the contrary, it is kept dry after it has been smoked. Rubber kept always moist tends to become more sticky and to lose its resilience; sometimes it even putrefies.

Four trade marks are recognized in Casamance.

A. P. « Aku prima ».

A. « Aku ».

A. M. « Average Aku ».

B.

The A. P. quality has almost disappeared, and A. is now considered the best; after this comes A. M., which does not contain earth, and B. which, besides various other impurities, contains also sand and even mud. In any case, it appears that A. alone is absolutely free from earth, so much so, that firms which furnish this quality are exempt from the risk of fluctuation in the market and can always sell it under the most advantageous conditions; while the qualities, A. M. and B. are often neglected when prices fall.

II. *Plantation rubber.*

Rubber from the plantations is always preferred in international trade; it is natural therefore, that, in addition to the measures which have been suggested to encourage the production and facilitate the exportation of quality A., the question of planting rubber trees should also have been considered.

In 1895, a nursery of Ceara (*Manihot Glaziovii*) was made at Sedona and, in view of the threatened disappearance of rubber lianas, it was contemplated using Ceara, as a certain number of seeds and plants existed on the spot.

Ceara.

These trees multiply very rapidly, but unfortunately their prolificness is counterbalanced by the injury caused by the forest fires due to the carelessness of the natives. The Ceara must be some years before it can resist fires, so that the species seldom passes the limits of the forests.

Few reliable data exist as to the best age for tapping and on the yield of rubber, as well as regarding the best system of operation. It seems, that an adult tree gives from 8 ½ to 100 oz. of rubber per tapping in the dry season between January and June, a collector does not obtain above 8 ½ oz. a day. In these districts, the Ceara comes into leaf in July, and the tapping done from July to January would be more productive than that undertaken during the dry season when the incisions cicatrize badly, owing to the hot east winds, and sometimes bring about the death of the tree. Thus the winter tapping is best.

The operation should be carried out by means of horizontal or vertical incisions, but fish-bone or V shaped cuts must be avoided, as they are injurious to the tree.

Other rubber trees.

The Ceara is not the only rubber tree which thrives in Casablanca. Experiments made at Martinique with *Funtumia* seem to show that this tree also could be advantageously grown; it is very hardy and would resist the scorching winds well, its bark being less delicate than that of Ceara; further, its general appearance and greater supply of latex are also advantages over the latter tree. The observations made at the Agricultural Station of Mangacunda seem to confirm these views.

Funtumia and Ceara are trees suitable to averagely damp districts; but in plantations of some extent, inequalities of the ground are to be met with, where during the winter rains actual swamps occur; in these places *Hevea elastica* can be planted with advantage. As for *Hevea brasiliensis* and *Castilloa*, it can only be said that the experiments made at Mangacunda do not appear to be conclusive.

32 - Instructions for Experimental Tobacco Growing.

FILIP. Essai de culture de Tabacs. — *L'Agriculture pratique des Pays Chauds*, 1204 Year, No. 115, pp. 327-330. Paris, October 1912

In order to assist all those who desire to try cultivating tobacco in the colonies, the Colonial Garden of Paris has asked for and obtained a series of instructions, drawn up by the International Commission of Colonial Tobacco, of which the following is a summary:

Conditions for the production of light Tobaccos.

a) *Selection of varieties.* Those varieties that in their country of origin possess a low nicotine content.

b) *Soil.* Light permeable soils without permanent moisture are to be preferred.

c) *Manures.* Nitrogenous manures stimulate greater development of the leaves, greater thickness of the tissues and higher nicotine content. Potash on the contrary produces finer and more pliable tissues.

d) *Density of Plantation.* The nicotine content is lower the closer the plants are to each other. The weight of the crop increases with closer planting. Experiments made at the Colonial Garden in 1911 have shown that the weight of the crop increased by 60 per cent when 17 000 plants were grown on an acre instead of 8 500. For the production of light tobacco it is therefore profitable to increase the number of plants per acre.

e) *Number of leaves.* The nicotine content is in inverse ratio to the number of leaves, while the weight of the crop is in direct ratio, reaching a maximum between 15 to 20 leaves.

Conditions for the production of combustible tobaccos.

The variety is to be determined by trials of the combustibility of the leaves, and the soil that is selected must have sufficient assimilable potash. If it should be deficient in potash, this element must be added. For the reasons given above, if a heavy crop of tobacco with low nicotine content is desired, it will be necessary to ascertain by experiments with each variety which are the optimum conditions of closeness of planting and of number of leaves, on the plan given below:

Distance between the plants		Plot No.	No. of leaves per plants
		1	10
The same variety	24 X 32 inches = 8 500 per acre	2	15
		3	20
		4	10
	24 X 20 " = 13 300 per acre	5	15
		6	20
		7	10
	20 X 20 " = 20 000 per acre	8	15
		9	20

These figures hold good for Maryland, Burley, light Kentucky and other leaved varieties, Sumatra, Java, etc.

Conditions for the production of Nicotine Tobaccos.

According to experiments conducted in France it appears that the maximum of nicotine for a given area is obtained under the following conditions:

1. Leaving 6 or 7 leaves per plant.
2. Setting the plants at such a distance as to cover the soil without the leaves injuring each other. With the Lot variety this has been obtained by 8 100 plants per acre, with Sufi 12 100 per acre. The density of the plantation varies with the vigour of the plant, the climate and the soil. Experiments may therefore be made on the following plan:

Plants per acre	Plot No.	No. of leaves per plant
4 050	1	5
	2	7
	3	10
8 100	4	5
	5	7
	6	10
12 150	7	5
	8	7
	9	10
24 300	10	5
	11	7
	12	10

The subsequent cultivation is the same as for the fine tobaccos, only pinching off of the side shoots requires special care.

The Coffee Plant in Arabia.

PILLON, J. Le Caféier en Arabie. — *Agriculture pratique des Pays Chauds*, Year 12, No. 115, pp. 331-333. Paris, Oct. 1912.

The type-species *Coffea arabica* is the origin of four varieties, which are very different and transmissible characters and are all cultivated in Yemen. These are:

1. "*Matari*," a plant with very small berries, which is cultivated between the towns of Menakha and Souk-el-Chemis, at an altitude of about 2 000 feet; this is the most renowned of the Arabian species of coffee.
2. "*Haini*." This much resembles the latter, but has larger berries.
3. The "*Kérsi*" and "*Cohlaru*" varieties yield very good berries, but their quality is inferior to that of those brought by "*Matari*."

The Yemen includes two very different districts, both as regards the nature of the soil and the climate. From the shores of the Red Sea to the moun-

tains of Central Arabia there extends a vast sandy desert belt about miles wide, called the "Theama," consisting of recent alluvium, which surrounds the second district. This has a warm-temperate climate and remarkably productive. The temperature here varies from 14 to 26° in the day and drops to 22° C. at night during the summer. In winter, the thermometer drops to -1 and -2° C. at night, and rises in the day to 29° a higher temperature than it reaches in summer. The irregular rainfall amounts annually to from 800 to 2 000 mm. (32 to 80 inches). In this district, coffee plants are cultivated on terraces, which extend in steps from the base of the valleys to the highest summits. The natives have used all the primitive means at their disposal to retain the water and supply the soil necessary for the plants. The areas of these terraces necessarily vary according to the height at which they are made; the largest may be from $\frac{1}{8}$ to $\frac{1}{7}$ of an acre; there is about one coffee plant per square yard. The coffee plants are cultivated at between 4 000 and 6 600 ft., in large and deep ravines sheltered from the wind. These clefts are a characteristic of the geological formation of the mountains.

The coffee plants are given no manure; sometimes, when it is possible the native irrigates the plantation, but more usually, he digs basins around each stem; these are united by a channel, in order to utilise and equidistribute the rainwater. The coffee plant is never pruned; the natives merely ploughs the entire terrace before the awakening of vegetation and places the soil when the rain washes it away. The bad state of the plantation and the little care given to them cause the crop to be much inferior to that which could be obtained by systematic cultivation. The harvest takes place in December, and after a short preparation the coffee is transported on camels to Hodéidah, or to Aden, where Europeans prepare it for exportation to Europe. A shrub called "Gath" is sometimes cultivated together with the coffee plant; the young leaves of the former are used for chewing and contain small glands, which secrete a sugary liquid with excellent properties due to the presence of an alkaloid, which is probably analogous to cocaine.

34 - A Table Summarizing the Properties of the Different Vine Stocks adapting themselves to Different Soils.

BURNET, J. Tableau résumant les facultés d'adaptation des différents porte-greffes à différents terrains. — *La Petite Revue Agricole et Horticole*, Year 18, No. 430, p. 24 Antibes, November 10, 1907.

Nature of the Soil.	Suitable varieties.
Non-calcareous soils, provided they are not too dry, or shallow, or too damp, limit of lime 20 per cent, rather light, or semi-light.	Riparia Gloire de Montpellier
The same soils, but dry, though not exclusively so, limit of lime 15 to 20 per cent.	Rupertia X Cordifolia 107-11. Cordifolia X Riparia 125-1.
The same soils, not excessively dry, lime limit 20 per cent.	Riparia Grand Glabre, Rupertia X hybride Astemar 215-2, Astemalis X Riparia 199-1b.

*Nature of the soil.**Suitable varieties.*

Same soils, not excessively dry, lime limit up to 5 per cent.

Same soils, not excessively dry, lime limit 25 to 30 per cent.

The same soils, not excessively dry, lime limit 30 to 40 per cent.

Ground with stones and soil mixed, provided they answer to the following conditions.

Soils apparently dry but deep, being neither damp nor dry, especially as regards the sub-soil, having good warm exposures-slopes.

Heavy soils, which cake, argillaceous, containing analysis a large proportion of fine sand (which occurs in the case of many soils of glacial clay). Lime 30 per cent.

Lime 25 per cent.

Lime 25-35 per cent.

Lime 40 per cent.

Lime 45-55 per cent.

Soils containing more than 55 per cent. of lime, provided that there is no stagnant moisture in the sub-soil.

Soils compact, or not, with 25 to 30 per cent. of lime, very damp.

Soils very dry to great depths, non-calcareous.

Soils very dry to great depths; calcareous.

For some stocks which have not yet been tried in France from the point of view of chlorosis, viz. *Riparia* × (*Cordifolia* × *Rupestris*) 1068 etc., the writer fixes a lime resistance limit according to the vine-growing literature of our districts.

Riparia × *Rupestris* 11 F, *Riparia* × (*Cordifolia* × *Rupestris*) 106-8.

Riparia × *Rupestris* 101-14.
Rupestris × *Riparia* 75-1.

Rupestris × *Riparia* 108-103.
(*Cinerea* × *Rupestris* de Grasset) × *Riparia* 109-6-20.

Riparia × *Rupestris* 101-16.
Riparia du Colorado.

If they have not more than 20 to 25 per cent. of lime.

Rupestris Martin,
Rupestris du Lot.

With 30 to 40 per cent. of lime.
Rupestris du Lot.

Berlandieri × *Riparia* 420 A.
Berlandieri × *Riparia* 420 B.
Chasselas × *Berlandieri* 41 B.

Riparia.
Riparia × (*Cordifolia* × *Rupestris* de Grasset) 1068.

The last may be tried up to 25 per cent.

Riparia × *Rupestris* 101-14.
Riparia × *Rupestris* 101-16.

Riparia × *Rupestris* 3309-3306.

Aramon × *Rupestris*, Ganzin No. 1.

Mourvèdre × *Rupestris* 1202.
Berlandieri × *Riparia* 157-11.

Berlandieri × *Riparia* 420 A.
Berlandieri × *Riparia* 420 B.

Chasselas × *Berlandieri* 41 B.

Solonis × *Riparia* 1616.

Riparia × (*Cordifolia* × *Rupestris*) 1068.

Cordifolia × *Rupestris* 107-11.
Cordifolia × *Riparia* 125.

Bourisquon × *Rupestris* 603.
Cabernet × *Rupestris* 33A.

Cordifolia × *Riparia* 554-5.

35 - The Vineyards of the Côte-d'Or (France).

PACOTTET, P.: Les Vignobles de la Côte d'Or. - *La Vie Agricole et Rurale*, No. 47, pp. 562-565. Paris, October 1912.

The department of Côte-d'Or contains the most celebrated vineyards of Burgundy, which produce the finest red and white wines of the world.

The vineyards are divided into four districts: Beaune, 39 500 acres; Dijon, 17 300 acres; Semur, 5 000 acres; Châtillon, 2 500 acres; *i. e.* 64 300 acres of entirely reconstituted vineyards. They form several regions: la Côte, l'Arrière-Côte, Val-de Saône, l'Auxois and le Châtillonnais. Val-de-Saône consists of marly slopes, which overlook the bed of the Saône. With the Melon grape, on the slopes of Ecuellen, Chivres, and Labergement, very good ordinary white wine is produced for drinking when new.

Arrière-Côte is composed of coombes and gullies separating the hills, which form the immediate and highest background of the slopes of la Côte. The latter, l'Auxois and le Châtillonnais, districts lying further in the mountains of the Côte-d'Or, produce quantities of red wines from the Gamay grapes and their varieties, the highly coloured Gamays.

Parallel to the Saône at a distance of 12 miles from the river and separated from it by a plain covered with cereals and forests, the portion of la Côte containing the vineyards that produce the finest wines forms an almost straight continuous line of slopes between Dijon and Chagny. These vineyards form a belt from a third of a mile to a mile and a quarter in width which rises to about half way up the slopes (an altitude of from 725 to 900 ft.) where they join waste, dry, stony land forming the summits of the hills. The soil is always more than 20 inches deep and is composed of very red vegetable soil, chiefly marl, full of small stones.

In les Romanées, on account of the frequent additions of decalcified soil from the plateaux, which have been repeated for centuries, the vegetable soil reaches a depth of from 5 to 6½ ft. Often two or three supporting walls on the slopes serve as roads and form two or three terraces to keep up the soil.

The subsoil consists of three important stages of the Jurassic: Bajocian, Bathonian and Oxfordian, overlain at times, as at Beaune, with a third stratum of Rauracien (1) with a corallian facies.

The Côte de Gevrey-Chambertin is on the Bajocian, a hard crystalline limestone. Côte de Nuits is situated on the Bathonian, a fine, hard limestone while the Oxfordian dominates on the Côte de Beaune, where it has a pseudo-lithographic limestone, or a marly facies. These different geological stages, though all represented by limestones, impart very distinct characteristics to the wines.

Those from the Côte de Beaune, where the lime content of the soil is increased by the marl, are very fine in quality, have much bouquet, and are also very delicate, but they do not keep so long as the more full-bodied wines of Côte de Nuits with their larger amount of bouquet. The wine

(1) A name proposed by Greppin for the "Corallian".

Cote de Gervey-Chambertin are a little deeper in colour and have more body than the former.

All the soils which produce wine of the best quality are deep, the soil is always damp and their good chemical composition is shown by the following analysis.

Analysis of the soil of the principal vineyards of Côte d'Or.

Amount of substances determined per thousand parts by weight	Chambertin	Clos-Vougeot	La Romanée	Les Saint-Georges	Bresandes, Beaune	Montrachet
1	104	—	270	167	320	104
stones	216	—	—	253	—	220
soil	680	—	730	580	680	676
analysis of fine soil :						
.	450	598	509	634	307	337
.	460	272	349	102	235	281
iron compounds	48	110	59.4	122	318	316
silica	23	—	—	18.8	—	24.9
potash	1.68	1.67	—	1.79	—	1.47
phosphoric acid	2.19	2.68	—	2.14	—	1.93
lime	3.06	2.81	—	3.87	—	5.20
nitric acid	1.53	4.03	—	1.10	—	traces
uric acid	traces	—	—	0.08	—	—

Pinot noir, with its colour varieties ranging from "Pinot gris" or "Pinot blanc" to "Pinot noir" and its numerous varieties, are the only vines of the Côte d'Or. The large vineyards producing red wine in the Côte d'Or. Formerly 1/3 to 1/20 of Pinot blanc Chardonnay was added. The latter is the variety cultivated for the production of the famous white wines of Meursault and Beaune. In the latter, as it was not very productive, the *Pinot gris* variety was associated with it; this produces excellent wines on the stony or marly summits of la Côte. On the plain, at the foot of the Côte, Gamay varieties give strong, coloured wines which are rather harsh. The *Pinot noir* variety is associated in some vineyards with the *Pinot gris*, or its grapes are mixed in the vat with those of the latter; the resulting wines are excellent and are known under the name of "Passe-tout-grains." The red and white wines are classed under the heads of "tête de cuvée", "première cu-

vée," "deuxième cuvée," "troisième cuvée," after which come the "première cuvée," "tête de cuvée," "grands ordinaires," "ordinaires". The two last are Gamay wines.

The vineyard of la Côte is divided into three districts: 1) Côte de Dijon; 2) Côte de Nuits; 3) Côte de Beaune. The Côte de Dijon has no first vintage. But on the other hand, at Chenôve, Fixin, and Brochon excellent "Passe-tout grains" is made. The Côte de Nuits, of which the Côte de Gevrey-Chambertin is a subdivision, produces the following wines: a) Gevrey-Chambertin: Chambertin and Clos de Bèze (tête de cuvée); b) Morey: Clos de Tart (tête de cuvée); c) at Chambolle-Musigny: Musigny (tête de cuvée) the wine of finest quality in all Côte d'Or; d) at Vougeot: Clos Vougeot (tête de cuvée); e) at Fageay-Echézeaux: Echézeaux (tête de cuvée); f) at Vosne-Romanée: Romanée Conti, the most excellent of all the red wines; Romanée, Romanée Saint Vivant, Tâches, Richebourg all "tête de cuvée"; g) at Nuits-Saint-Georges: Saint-Georges, Clos de Vaucrains, "tête de cuvée."

Besides the great red wines, the Côte de Beaune produces also class white wines wherever the calcareous marls of the Oxfordian predominate. These include a) at Pernand: Charlemagne, white and red, Vergelesse varieties, "tête de cuvée"; b) at Aloxe-Corton: the Corton Charlemagne varieties (tête de cuvée); c) at Savigny-les-Beaune: Volailles (tête de cuvée); d) at Beaune: Grèves; e) at Pommard: the Ruffey varieties, ("haut et bas," "tête de cuvée"); f) at Volnay: En Caillottes (tête de cuvée); g) at Meursault: Perrier, Charmes, Genevrières, Gouttes d'Or are all white wines of the "première cuvée"; h) at Puligny-Montrachet: Montrachet aîné (tête de cuvée) is grown entirely on salmon-pink marls of the lower Bathonian; above this, halfway up the slope, Chevalier Montrachet is cultivated in a poor red soil with a stony subsoil, while below it Bâtard Montrachet grows in a deeper, richer soil; further down nearer the plain, it yields remarkable wines "de première cuvée"; i) at Chassagné-Montrachet: Clos Saint-Jean (tête de cuvée); j) Santenay: Gravières.

The vines were formerly planted thickly, 8 000 or 10 000 stocks per acre; they are now arranged in lines and do not contain more than about 4 000 vines per acre. Layering the vines tends to decrease.

The addition of new soil is now rarely practised, as the system has become too costly, but the vines are given stable-manure, or chemical fertilizers, which was formerly avoided.

The vines are pruned to low stocks with three or four branches; less the canes longer, which suits the Pinot variety well, is not practised, it diminishes the quality of the fruit, though it considerably increases the quantity.

Only a few proprietors pick over their grapes, which are as a rule so ripe that they can be pressed in vats of small volume, 440 to 1760 gallons, after which it is placed in new oak casks, in which it is sold, after having been kept two, three and four years.

Viticulture in the Department of Concordia (Entre Rios, Argentina).

ANZORENA, PEDRO. La Viticultura en el Departamento de Concordia. — *Boletín del Ministerio de Agricultura*, Vol. XIV, No. 7, pp. 621-636. Buenos Ayres, 1912.

From its geographical situation, the department of Concordia is ded in the zone of vine cultivation, but the physico-chemical nature e soil renders this industry unremunerative at present. Nearly all vineyards are to be found in the neighbourhood of the town of ordia and for 8 or 10 years they have not been extended, although undulating and hilly configuration of the district is very suited to cultivation. The soil, which is entirely siliceous, attains a depth ionally of 1 metre (3 ft. 3 in.) and rests upon a clayey or loamy oil, generally of an impermeable character; sometimes the soil and ubsoil are alike in composition.

There is a scarcity of lime, phosphoric acid, and especially of nitrogen e soil and the vine consequently grows badly and bears little fruit; er, the humidity of the subsoil is very conducive to the development ngoid diseases, which have all been observed in the vineyards. Thus,

advisable to alter the physical and chemical properties of the soil means of drainage and the addition of lime, as well as of organic mineral fertilizers. On soil thus prepared, hoed crops, or leguminosae be grown for two or three years; planting should be regular and the m of cultivating and of pruning which is chosen should be adapted e soil, the climate, and the vines.

Green pruning is advisable as it always tends to ensure a better and t crop; the weeds should be carefully removed and the soil kept iently damp, but not excessively humid, as it is at present.

So far, only one variety of vine is known in the district viz. "Lorda," h resembles Malbeck and Tannat. This is grown on its own stock, he practice of grafting on American vines is becoming increasingly hon. The Lorda variety is very resistant to fungus diseases, but few grapes, so that it would be well to replace it by kinds which adapt themselves to the climate and soil.

t appears, that preference should be given to white table wines and wines for blending. The former could very well be used in the ration of imitations of Marsala, Port, Sherry, Malaga, etc.

The stocks which are most recommended for the Department of rdia are the following: Riparia Gloire de Montpellier, Riparia Glabre, Rupestris Monticola, Rupestris du Lot, Riparia Râpe-

As regards the wine making, the writer states that it is done under est conditions and according to modern methods.

r. Anzorena advocates the creation of ~~an~~ experimental nurseries ards and cellars.

37. Report on Fruit Culture in the School of Practical Agriculture Wagnonville.

PREZLER, M. Rapport sur les cultures fruitières de l'École Pratique d'Agriculture Wagnonville. — *Journal de la Société Nationale d'Horticulture de France*, Fourth Series, Vol. XIII, pp. 636-639, Paris, October, 1911.

The following report was drawn up by the writer subsequently to the visit paid by the members of the commission of the National Horticultural Society of France for the purpose of examining on the spot the pruning operations carried out upon fruit trees and especially pear-trees, by M. Lorette, Cultivation Director at the School of Wagnonville (Nord).

The soil of the school gardens is clayey or loamy to a depth 20 to 23 ft.; the arable stratum has been much improved to a depth 16 to 20 inches. The trees are vigorous and receive a liberal annual dressing of manure. All the pear-trees are grafted on quinces.

The shapes used are, in the open, the winged pyramid (with four wings which is much recommended by M. Lorette as affording the trees much light; the classic shapes are also employed: U and double U, Verrier palm-leaf, etc.

The pruning methods adopted by M. Lorette, and which have lately attracted much attention, do not completely revolutionize the pruning principles of the so called "three bud" system; but the latter have been greatly modified by him, the most important changes being the accelerated bearing of fruit on suckers and on vigorous fruit branches.

The following is a summary of M. Lorette's methods of pruning.

Leading branches. The leaders of trees in course of being trained are not pruned except when necessary to obtain the different stages or in removing the portion of the branch, which is not sufficiently lignified; this is done during May when vegetative growth is already active and the shoots are an inch or more in length; in cases where the terminal bud has become a flower bud it has nevertheless to be removed.

In the winged pyramid, the first stage is made by one pruning, the branches thus obtained are not shortened, but are placed in the horizontal position and then bent up; they continue to grow up to the top of the tree. The branches of the successive stages are obtained by cutting them back at a distance of 20 inches from the preceding stage, training the branches thus obtained horizontally and bending them up for a length of 8 to 10 inches against the branch coming from below.

For the prolonging of the stem the least vigorous branch should be selected; nearly always the buds growing from the dormant buds are chosen. It is necessary during the vegetation period to free the prolongations of the leaders from all the false buds which are likely to develop by cutting the latter at a few millimetres from their base.

If there is a want of equilibrium between the various prolongations this must be restored by cutting a third, or a half, of the blade of the leaf growing on too vigorous branches.

In the case of trees which are completely trained, the branches which prolong the leaders are left intact during the vegetation period and through

at the winter. After the sap awakens, in May, they are removed at their base. Choose amongst the numerous secondary buds one which seems the weakest; keep this intact and remove the others; this operation should be repeated every year.

The object of not pruning the leading branches on trees in process of raining, is to obtain weak fruit branches, sometimes even only fruit buds; nevertheless fruit branchlets may develop.

Fruits. — Towards the 15th of June, the fruit branchlets of from 10 to 12 inches in length are treated as follows :

1. Those which have attained a thickness of 7 to 8 millimetres and more, are cut back at 8 to 10 millimetres from their point of insertion; one or more stipular buds develop which can become spurs, or new fruit branchlets.

2. The fruit branchlets which have not attained to the above-mentioned thickness, are cut to 3 eyes; one or two false buds may develop, which are cut back to 8 to 10 mm. if these are new fruit branchlets; when they are spurs, in which case they are left intact.

3. The fruit branchlets which develop on the cluster spurs should be cut back to some millimetres in length. On the 15th of July, the second pruning is done; this consists as before in cutting back to 8 to 10 mm. the fruit branchlets derived from false buds, or stipular buds, which are 7 to 8 mm. thick. Cut back the weakest to three eyes, or force them through with a grafting knife between the 3rd and the 4th leaf.

It would be natural to suppose that the suppression of these buds would cause the spurs to develop into fruit-branchlets and cause a serious disturbance on the growth of the tree. The Commission examined a pear-tree Doyenné d'Alençon from which over 400 buds had been removed July 15 (second pruning), and found only a few shoots, although the tree was vigorous.

On August 15, a new operation is carried out according to the same system; in September the shoots on the spurs are cut back and also those of the fruit buds, which latter are thus able to profit by all the available sap. In winter the supernumerary fruit buds should be removed.

By this pruning method M. Lorette considers that he obtains more fruit buds than by the ordinary system; the resulting buds are stronger, and contain 17 or even 20 flowers; in the event of frost, the flowers in the centre of the inflorescence protect those of the periphery which are placed below them. Further, this method of pruning requires less time.

The members of the Commission were unanimous in declaring that the trees were very vigorous and were regularly covered with fruit branches from top to bottom, the latter being more numerous and shorter than is usually the case; the number of leaves was consequently larger. Even the horizontal portions of the branches, above and below alike, fruit buds were found; no part was bare.

With regard to counter espaliers and espaliered forms, the yield was very large and the trees were healthy. The results appeared less satisfactory on espaliers, which bore little fruit.

* As M. Lorette himself explained, too many fruits had been left on this year.

The members of the Commission themselves counted: 156 fruits of almost normal size on 7 feet of the branches of *Beurré Sterckmans*, i. e. about 22 to the foot; on 3 ft. 3 in. of *P. Doyenné du Comice*, 21 fruits weighing about 100 grammes on August 22; on 3 ft. 3 in. of *P. le Lectier*, 17 fruits were obtained.

To sum up: the Lorette method of pruning seems to give good results, especially in the case of trees in the open; it is more adapted to pear-trees than to apple-trees, and is especially advantageous where the trees are very vigorous; a liberal supply of manure should be given at the same time.

It would be premature to say that the above-mentioned operations are always successful, for all shapes, in all climates, on every soil and with any exposure; it is necessary to experiment, and after some years, when the examples are more numerous, it will be possible to form a definite opinion on the subject.

38 - Is it Necessary to Fertilize an Apple Orchard?

HEDRICK, U. P.: *Thirtieth Annual Report of the New York Agricultural Experiment Station (Geneva, Ontario County) For the year 1911*, Bulletin No. 339, pp. 262-304 + fig. 5-11 + plates XVII-XX. Albany, 1912.

Id.: A Comparison of tillage and sod mulch in an apple orchard. *Twenty-eighth Annual Report of the Board of Control of the New York Agricultural Experiment Station (Geneva, Ontario County) For the year 1909*, pp. 435-490 + plates XXV-XXXI. Albany, 1910.

Id.: Orchard Management. *Ib.* pp. 526-537.

New York Agricultural Experiment Station, Bulletin No. 289.

A problem which remains to be solved is that of fertilizing apple orchards. The current recommendations for fertilizers in orchards are of little value, for few experiments have been made which have furnished accurate data. The methods usually practised are almost exclusively based upon fertilizing field and garden crops, but the requirements of the apple-tree cannot be compared to those of herbaceous plants owing to the great difference in the habits of growth of the two kinds of plants. Fertilizing apple trees is also a difficult question, for besides there being variability of plants and environment to contend with, it is necessary to consider the tree and the future crop.

Four Experiments at New York Agricultural Experiment Station.

With the hope of throwing some light on orchard fertilization, the New York Agricultural Experiment Station has undertaken several experiments. In one of these, the effects of potash, acid phosphate and lime were tested; the second was combined with a test of tillage and sod-mulch; the third is now under progress in a continuation of the orchard management test just mentioned; in the fourth, the fertilization of orchards which are not in sod is studied. The last experiment is of double importance. In the first place, it is the only experiment which has been carried on for a sufficiently long period *viz.* 1908-1912. Further, as the disturbing influence of the grass has been eliminated, the effect of the fertilizer on the apple trees will be more decisive.

The site and soil of the experiments.

The experiments in question were carried out in an orchard where the was a heavy clay loam and had been used for the ordinary rotation of crops.

There were 12 plots, each containing 5 trees and separated by single s of trees not in the experiment. There were four fertilizer plots in duplicate in the experiment and four check plots; the latter were reduced to 1/2.

The fertilizers used were as follows:

Stable manure	plots 1 and 9; average per year	415.15 lbs. per tree
Acid phosphate	" 2 " 8 " " "	12.66 " " "
Muriate of potash	" 6 " 10 " " "	7.26 " " "
Acid phosphate		12.6 " " "
Muriate of potash	" 4 " 12 " " "	7.26 " " "
Acid phosphate		12.6 " " "
Nitrate of soda	" 4 " 12 " " "	3.67 " " "
Dried blood		12.84 " " "

It is noticeable, that since the fertilizers were put on only underneath branches of the trees, a tremendous excess of each was used. This experiment should therefore show whether excessive fertilization is deleterious to trees or not. The trees used were Rome, top-worked on Ben Davis, some buds all having come from one tree, and the stocks were carefully selected in order to obtain an orchard as free from individual variation as possible. The trees in the orchard were amply cross-pollinated.

Results of the experiments.

In gauging the value of the different fertilizers, it is necessary to consider top, size, colour, flavour, time of maturity, texture of flesh and the keepability of the fruit, and also the diameter of the tree, the colour and height of the foliage and the length and weight of the annual growth of the branches. It may be said that the experiments did not prove the truth of the current opinion of the effect of fertilizers on apple trees: the yield did not seem to have been larger; on the other hand, the size of the trees had a tendency to increase, while the percentage of culls was a higher one on the check plots. In any case, the colour, flavour, and keepabilities were not influenced by the fertilizers. The measurements of the diameters of the tree trunks only showed differences due to ordinary causes of variation.

The most noticeable effects were obtained by the application of nitrogenous manures; the leaves were greener and also weighed more and the annual growth of the branches was increased.

Analysis of the soil also showed that the upper twelve inches of the soil at the beginning of this experiment contained sufficient nitrogen to last for trees bearing twenty bushels of fruit for 183 years and enough phosphoric acid and potash to supply them for 183 and 713 years respectively. Thus as the experiments have shown with these large reserves all

that is necessary is yearly ploughing and thorough cultivation, together with the ploughing under of cover crops.

Commercial fertilizers are therefore little needed, except on sandy and gravelly soils deficient in potash or phosphates and subject to drought or those of such shallowness or mechanical texture as to limit the range of apple trees, or which are too wet, too dry, or deficient in humus. Some apple orchards may require two of the elements, but few should need a complete fertilizer.

A fruit-grower may assume at once if his trees are vigorous, bear well and making a fair amount of new wood, that they require no fertilizer. If the trees are not in this condition, attention should be paid first to drainage, tillage and the health of the trees, before having recourse to the use of fertilizers. Before applying the latter on a large scale, it is necessary to carry out a fertilizer experiment.

Plan for a Fruit Grower's Fertilizer Experiment.

The fruit grower may determine by a plan adapted from this experiment, what fertilizers his orchard needs. The trees selected should be of the same variety and age, and the soil as uniform in texture and fertility as is possible. There should be a sufficient number of trees in each plot to offset individuality in the former; five is the minimum number that should be used with any degree of accuracy.

On plot 1, use stable manure to supply 50 lbs. of nitrogen to the trees per year. This, on the average, would be about $5\frac{1}{2}$ tons per acre. In an orchard where the trees stand 40 ft. apart, use about 400 lbs. per tree.

On plot 2 use a phosphate fertilizer in sufficient amount to supply 100 lbs. of phosphoric acid per acre per year. A good recommendation is 100 lbs. of 14 per cent. guaranteed acid phosphate per acre, or 13 lbs. of fertilizer per tree.

On plot 3 apply muriate of potash guaranteed 48 to 52 per cent acid potash. Apply 100 lbs. of potash per acre, which would require 200 lbs. of muriate of potash per acre, or 8 lbs. per tree. Combine with the phosphate in the amounts prescribed for plot 2.

On plot 4 use a complete fertilizer consisting of nitrogen as applied on plot 1 and of phosphoric acid and potash as applied on plot 3. Or for a check, use stable manure substitute 350 lbs. per acre (13 lbs. per tree) of dried blood with 9-12 per cent of nitrogen, or 100 lbs. per acre ($3\frac{2}{3}$ lbs. per tree) of nitrate of soda. Plot 5 should be a check.

If it is thought desirable to test the influence of lime, duplicate the experiment with the addition of 25 lbs. of slaked stone lime per tree.

All things considered, the best time to apply fertilizers is the spring, as soon as the ground can be worked. Spread broadcast about the tree an area slightly larger than that covered by the branches. In cultivated orchards the complete fertilizer should be harrowed in and the manure ploughed under. The experiment is to be at all conclusive, such an experiment should last for several years. The crop should be weighed and measured at harvest time to determine the relative value of the different treatments.

It is not sufficient to keep count of the marketable fruit from each plot; and windfalls should be accounted for. All plans and preparations for such experimentation can be made in the ter, so that the actual work in the spring need not be great.

- Promising New Fruits.

TAYLOR, U. A. and GOULD, H. P. in *Yearbook of Agriculture for 1911*, pp. 423-438. Washington, 1912.

The following new fruits are described at length, as they are expected to possess a value in the future development of fruit culture, the Department of Agriculture has no stock of these varieties available for distribution.

1. *Cornell Apple*. — grown by T. O. Duvall, Burstonville, Monticery Co., Md.
2. *San Jacinto Apple* — grown by Dr. A. M. Ragland, Pilot Point, tton Co., Tex.
3. *Shiawassee Apple* — grown by H. C., & M. D. Ward, Pontiac, dland Co., Mich.
4. *Ayer Pear* — grown by O. H. Ayer, Sibby, Douglas Co., Kans.
5. *Russel Peach* — grown by F. O. Harrington, Williamsburg, ra Co., Iowa.
6. *Laire Plum* — grown by E. Bartholomew, Stockton, Rooks, Kans.
7. *Montcett Plum* — grown by R. Bates, Jackson, Aiken Co. S. C.
8. *Panarity Grape* — grown at the Cooperative Experiment Vine-d, Fresno Co., Fresno, Cal.
9. *Thomson Orange* — grown at Riverside, Cal.

Remarks on the Coco Palm.

MAIN, F. Considerations sur le Cocotier. — *Journal d'Agriculture Tropicale*, Year 12, No. 136, pp. 292-298. Paris, Oct. 30, 1912.

In referring to the two works of H. Hamel Smith and of W. Barrett, ch draw attention to the economic value of plantations of Coco palms, writer gives a rapid review of the most recent publications dealing with the cultivation of these trees. (1) He especially examines the disputed stions (for though the cultivation of the coco-palm is a task of extreme plicity, the different writers are, nevertheless, not of one mind on subject), and attempts to show the conclusions to which experts inclining and to specify the figures which are gradually being ac- ad.

(1) Abstracts of a number of articles on the importance and the technical ms of this cultivation have appeared in the *Journal d'Agriculture Tropicale*, amongst others, Nos. 2691 and 2695 of B. Aug.-Sept.-Oct. 1911, and Nos. 2700, 2701, 2702, 2703, 2704, 2705, 2706, 2707, 2708, 2709, 2710, 2711, 2712, 2713, 2714, 2715, 2716, 2717, 2718, 2719, 2720, 2721, 2722, 2723, 2724, 2725, 2726, 2727, 2728, 2729, 2730, 2731, 2732, 2733, 2734, 2735, 2736, 2737, 2738, 2739, 2740, 2741, 2742, 2743, 2744, 2745, 2746, 2747, 2748, 2749, 2750, 2751, 2752, 2753, 2754, 2755, 2756, 2757, 2758, 2759, 2760, 2761, 2762, 2763, 2764, 2765, 2766, 2767, 2768, 2769, 2770, 2771, 2772, 2773, 2774, 2775, 2776, 2777, 2778, 2779, 2780, 2781, 2782, 2783, 2784, 2785, 2786, 2787, 2788, 2789, 2790, 2791, 2792, 2793, 2794, 2795, 2796, 2797, 2798, 2799, 2800, 2801, 2802, 2803, 2804, 2805, 2806, 2807, 2808, 2809, 2810, 2811, 2812, 2813, 2814, 2815, 2816, 2817, 2818, 2819, 2820, 2821, 2822, 2823, 2824, 2825, 2826, 2827, 2828, 2829, 2830, 2831, 2832, 2833, 2834, 2835, 2836, 2837, 2838, 2839, 2840, 2841, 2842, 2843, 2844, 2845, 2846, 2847, 2848, 2849, 2850, 2851, 2852, 2853, 2854, 2855, 2856, 2857, 2858, 2859, 2860, 2861, 2862, 2863, 2864, 2865, 2866, 2867, 2868, 2869, 2870, 2871, 2872, 2873, 2874, 2875, 2876, 2877, 2878, 2879, 2880, 2881, 2882, 2883, 2884, 2885, 2886, 2887, 2888, 2889, 2890, 2891, 2892, 2893, 2894, 2895, 2896, 2897, 2898, 2899, 2900, 2901, 2902, 2903, 2904, 2905, 2906, 2907, 2908, 2909, 2910, 2911, 2912, 2913, 2914, 2915, 2916, 2917, 2918, 2919, 2920, 2921, 2922, 2923, 2924, 2925, 2926, 2927, 2928, 2929, 2930, 2931, 2932, 2933, 2934, 2935, 2936, 2937, 2938, 2939, 2940, 2941, 2942, 2943, 2944, 2945, 2946, 2947, 2948, 2949, 2950, 2951, 2952, 2953, 2954, 2955, 2956, 2957, 2958, 2959, 2960, 2961, 2962, 2963, 2964, 2965, 2966, 2967, 2968, 2969, 2970, 2971, 2972, 2973, 2974, 2975, 2976, 2977, 2978, 2979, 2980, 2981, 2982, 2983, 2984, 2985, 2986, 2987, 2988, 2989, 2990, 2991, 2992, 2993, 2994, 2995, 2996, 2997, 2998, 2999, 3000, 3001, 3002, 3003, 3004, 3005, 3006, 3007, 3008, 3009, 3010, 3011, 3012, 3013, 3014, 3015, 3016, 3017, 3018, 3019, 3020, 3021, 3022, 3023, 3024, 3025, 3026, 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3359, 3360, 3361, 3362, 3363, 3364, 3365, 3366, 3367, 3368, 3369, 3370, 3371, 3372, 3373, 3374, 3375, 3376, 3377, 3378, 3379, 3380, 3381, 3382, 3383, 3384, 3385, 3386, 3387, 3388, 3389, 3390, 3391, 3392, 3393, 3394, 3395, 3396, 3397, 3398, 3399, 3400, 3401, 3402, 3403, 3404, 3405, 3406, 3407, 3408, 3409, 3410, 3411, 3412, 3413, 3414, 3415, 3416, 3417, 3418, 3419, 3420, 3421, 3422, 3423, 3424, 3425, 3426, 3427, 3428, 3429, 3430, 3431, 3432, 3433, 3434, 3435, 3436, 3437, 3438, 3439, 3440, 3441, 3442, 3443, 3444, 3445, 3446, 3447, 3448, 3449, 3450, 3451, 3452, 3453, 3454, 3455, 3456, 3457, 3458, 3459, 3460, 3461, 3462, 3463, 3464, 3465, 3466, 3467, 3468, 3469, 3470, 3471, 3472, 3473, 3474, 3475, 3476, 3477, 3478, 3479, 3480, 3481, 3482, 3483, 3484, 3485, 3486, 3487, 3488, 3489, 3490, 3491, 3492, 3493, 3494, 3495, 3496, 3497, 3498, 3499, 3500, 3501, 3502, 3503, 3504, 3505, 3506, 3507, 3508, 3509, 3510, 3511, 3512, 3513, 3514, 3515, 3516, 3517, 3518, 3519, 3520, 3521, 3522, 3523, 3524, 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3691, 3692, 3693, 3694, 3695, 3696, 3697, 3698, 3699, 3700, 3701, 3702, 3703, 3704, 3705, 3706, 3707, 3708, 3709, 3710, 3711, 3712, 3713, 3714, 3715, 3716, 3717, 3718, 3719, 3720, 3721, 3722, 3723, 3724, 3725, 3726, 3727, 3728, 3729, 3730, 3731, 3732, 3733, 3734, 3735, 3736, 3737, 3738, 3739, 3740, 3741, 3742, 3743, 3744, 3745, 3746, 3747, 3748, 3749, 3750, 3751, 3752, 3753, 3754, 3755, 3756, 3757, 3758, 3759, 3760, 3761, 3762, 3763, 3764, 3765, 3766, 3767, 3768, 3769, 3770, 3771, 3772, 3773, 3774, 3775, 3776, 3777, 3778, 3779, 3780, 3781, 3782, 3783, 3784, 3785, 3786, 3787, 3788, 3789, 3790, 3791, 3792, 3793, 3794, 3795, 3796, 3797, 3798, 3799, 3800, 3801, 3802, 3803, 3804, 3805, 3806, 3807, 3808, 3809, 3810, 3811, 3812, 3813, 3814, 3815, 3816, 3817, 3818, 3819, 3820, 3821, 3822, 3823, 3824, 3825, 3826, 3827, 3828, 3829, 3830, 3831, 3832, 3833, 3834, 3835, 3836, 3837, 3838, 3839, 3840, 3841, 3842, 3843, 3844, 3845, 3846, 3847, 3848, 3849, 3850, 3851, 3852, 3853, 3854, 3855, 3856, 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Growth of the Coco Palm. — It has often been stated that this tree cannot grow at any distance from the sea, but it has now been proved that it thrives as far as 300 km. (186 miles) inland. The neighbourhood of the sea is, nevertheless, beneficial to this palm, and in the Philip-
 pines, for instance, the coast is almost uniformly bordered by stands of coco-trees. On the other hand, the excessive transpiration of the leaves, which in the case of a tree in full growth, can amount to 45 litres (10 gals.) per day, necessitates a climate of sufficient humidity to compensate for the large amount of water lost by this means.

Making a plantation. — After comparing the different estimates and schemes published by various writers, and making allowance for the fact, that during the first 7 years only expense can be looked for, M. Main concludes, that the expense of an area of 2470 acres planted with 100 000 coco palms should be estimated at from £114s to £16 per acre. It is not possible, at present, to reduce the difference between these two figures, but writers who estimate by the single tree and reckon the cost price of a palm of from 6 to 8 years at 6s 2 $\frac{1}{2}$ d or 6s 8 $\frac{1}{4}$ d, consider, taking about 40 trees per acre, that the results work out in accordance with the above figures. It seems thus reasonable to fix the capital necessary for making a plantation of 2470 acres with 100 000 coco-palms at from £32 000 to £36 000; necessarily, the sum is not equally divided over the first 7 years.

Selection and Varieties. — Messrs. Barrett, Zaepernick and Smith are not all agreed as to the existence of true varieties for selection and of general rules to be observed in order to improve the production. Nevertheless, it seems certain that the copra yield varies with the district and the cultivation and probably also according to the varieties. About 20 varieties are believed to exist in Malaysia.

Interplanted Crops. — As a rule, the cultural operations are not the subject of much controversy; but on the other hand, the question of associated crops is much discussed. The latter are increasingly planted under certain conditions. The present idea is, that those crops must be selected which give an immediate return, as they can only be planted the second year, and must be given up after the fifth, or sometimes even after the fourth year, in order, that the coco-palm may derive the entire benefit from the nutritive substances present in the soil. The plants most used are manioc, pineapple, pepper-plant, coffee (*Coffea robusta*), mimosa, and various Leguminosae, agave, maize, earth-nut, etc. Amongst the Leguminosae, *Crotalaria* is an especial favourite. *Coffea robusta* is well spoken of also, as from the second year, it is capable of yielding 160 lbs. to 180 lbs. per acre; in the third year the crop exceeds 450 lbs. and is 1800 lbs. the two succeeding seasons. These figures largely counter-balance the cost of the crop and allow of the crop being up-rooted after the fourth year, should the coco palms require it.

It seems the general opinion that coco trees which are manured by grazing live stock yield larger and larger crops; but the age at which

trees have nothing to fear from the animals is, however, still a moot point, and there are no data available as to the facilities for the purchase and sale of live stock.

Improvements and fertilizers. — It is generally recognized that phosphoric acid and nitrogen are more clearly useful than potash, although the latter is also necessary.

Farm-yard manure is one of the best fertilizers; cakes, organic manures and ground bones are also excellent, as is also especially the green manure consisting of the Leguminosae which have formed the intercalary crop. Common salt, which has been hitherto regarded as a very good fertilizer for the coco-palm, is no longer in favour and it is considered that chloride of potash fertilizers are sufficient.

Yield. — The different writers estimate the number of nuts required to produce 1 ton of copra, at from 4000 to 7000. The divergence between the figures is doubtless due to the differences in the weight of the nuts and the yield by the different varieties which are planted.

Opening and drying the nuts. — There are a few machines for opening the nuts, but the writers have, so far, not taken them into account, for the extraction of the kernel by means of an iron rod, or "bolo" is considered almost generally to be the best method, and it is still believed that an excellent quality of copra can only be obtained by drying the nuts in the sun. The drying apparatus are not as yet perfect, but when they work well, they furnish a copra which is preferred by some producers and exporters.

"Coir" (Fibre). — Hamel Smith's book gives interesting details concerning the mechanical extraction of "coir", and in particular, a description of little-known machines. The mechanical preparation of "coir" may be considered as an improvement, which permits of its being always dried, and removes the prejudice according to which it was considered an unimportant byproduct to be collected only when possible:

Diseases and insect pests. — The writers who have been consulted mention rats as being enemies of the coco-palm, in addition to diseases and insects. Zaepernick advises the use of zinc bands to protect the palms from the attacks of these rodents. These bands are used in Europe on fruit-trees, but would be very costly in the case of a plantation of 10000 palms. O. W. Barret gives an account of the *Coleoptera*, which are only to be controlled by collecting them. "Bud rot" is the most serious bacterial disease from which the cocoa-tree suffers, it appears to be caused by *Bacillus coli*. The only method of control is up-rooting the infected palms and burning them (1).

(1) On the diseases and enemies of the coco-palm, and other abstracts in this Bulletin, those which deal specially with "bud-rot" are numbered 367 B. Dec. 1910. (Ed.).

41 - The Economic Importance to Portugal of the Cork Oak and Products.

KLEIN (Madeira). — *Naturwissenschaftliche Zeitschrift für Forst und Landwirtschaft*, X, 10, Part II, pp. 549-559. Stuttgart, November 1912.

Thanks to its geographical situation, its soil and its climate, Portugal possesses a rich tree flora. The forest timber which exists is mostly indigenous, but trees which have been introduced flourish equally well. Of great importance among the latter is *Cupressus glauca*; this occurs in large stands in Busaco and reaches huge dimensions; *Acacia melanoxylon* and *Eucalyptus globulus* should also be mentioned, and it is the latter which imparts to the Southern Provinces their characteristic note. From the forestry standpoint, Portugal is divided into three districts; the first that of *Pinus pinaster* Ait (pinheiro bravo), which extends from the Sado to the Minho and from the sea to the mountain chain and is swept by the sea winds. The second district is that of *Quercus suber* (sobreiro) and *Quercus azinheiro*, these trees here form not very dense forests extending over vast stretches of country, which are called "montados". This region extends from south of the Tagus to the coast of Algarve, and is almost throughout slightly undulating. Its climate is hot and dry, since rain rarely falls here between May and October. The third district is that of *Quercus pedunculata* (carvalho alvarinho), *Quercus tozza* (carvalho negral) and *Quercus lusitanica*, but the latter is of rarer occurrence and prefers the central portion, which it shares with *Castanea vesca*. This territory north of the Tagus is in places very mountainous, and the climate is variable and humid; heavy rain occurs, especially in the district between the Douro and the Minho. Until some decades ago, *Pinus pinea* grew in great masses in the valleys of the Tagus and Sado. But there was so large a demand for the wood of this tree for shipbuilding purposes and railroad construction that the pines were cut down in large numbers and have not been replanted or even replaced by the less valuable but more rapidly growing *Pinus maritima*. Now the mistake has been seen and this latter species is being chiefly planted.

The Cork Oak. — After *Quercus ilex*, which covers 618 000 acres, *Quercus suber* is the tree most widely grown in Portugal, where it occupies an area of 519 000 acres. The regions where it is chiefly cultivated lie south of the Tagus and indeed principally in the districts of Beja and Evora, in the centre of Pontalegre and in the Province of Algarve; here it often forms extensive closely growing stands. In the Tagus valley, the districts of Lisbon and Santarem and that of Castello Branco, this tree is not so well represented, but it still occurs in large stands; these decrease in size towards the north, and finally solitary individuals occur.

In south and central Portugal, the cork oak shows its usual habit; its stem is normally straight, its growth compact, it branches at from 10 to 15 ft. above the ground and forms a spreading bushy crown. In the north, on the contrary, this species occurs mixed with *Pinus maritima*, its trunk is more slender and often attains a considerable height, but this change of habit is also due to the method of pruning adopted. Here

ence a shade is avoided, as space is needed for intercalary crops, while to the south, where the cultivation is less intense and the estates larger, more stress is laid upon a greater production of cork and acorns. In the north, the development of horizontal branches is encouraged, which are regularly pruned in order to expose the crown to the effect of light and air. The flowering and fruiting seasons and the time of the fall of the acorns are approximately the same dates as in other Mediterranean countries. Sometimes cork oaks attain quite large dimensions. As an example, the writer cites a tree growing in the Estremoz district, which in one season yielded 3960 lbs. of cork. As regards their growth, many young plantations ("chapparaes") yield cork fit for use 23 years after planting, while stem cork is produced sooner, but the latter cannot be used in the manufacture of bottle corks.

The acorns are devoted to the fattening of pigs, although they are bitter than the fruit of *Quercus ilex*. It is estimated that of the million pigs which are reared annually in Portugal, one third are fed on the acorns of the cork oak and holm oak (*Q. ilex*). The total harvest amounts to 100 tons. If the proprietor is not himself a pig-breeder, he farms out his cork forest at the rate of from 20 to 25 shillings per head of swine to be fattened. The number of these animals to be fattened in a forest is decided locally. As a rule, the ground beneath the oaks is kept free from underwood and bushes; this promotes the growth of intercalary crops, obviates the danger of forest fires, and enables the pigs to find the acorns with greater facility.

The formation and ripening of the cork is hastened by working the forest, manuring for intercalary crops, and by the pigs during the fattening period. The cork is finest and thickest when it has formed quickest. All cork oak forests are of natural growth, and most new plantations are made arise by protecting a certain area against pigs and fire.

Usually, new plantations are made by sowing late autumn acorns, which are liberally obtained from oaks already known to be good cork producers. Acorns germinate very rapidly, the young trees require no further care, and on good soil, the first crop of male cork can be stripped off at the end of 2 years. Planting is rare and only occurs for small stands, or in order to fill up gaps. The cork oak forests are almost exclusively the property of private individuals, who either strip off the cork themselves, or lease the forest for 20 to 40 years.

Under the terms of the contract, the owner is often obliged to strip off the cork and to superintend the clearing of the forest, etc. The tenant undertakes to leave untouched the cambium layer ("corteza"). The cork is usually removed when the trees are from 15 to 20 years old. Stripping generally takes place between July and August 30, but is sometimes, though not frequently, effected in the first half of May. An interval of 9 or 10 years, often of from 8 to 12 years, elapses between each stripping; this time is necessary to obtain a cork of $1\frac{1}{4}$ in thick. It is not to weaken the tree unduly, and because branch cork grows more slowly than stem cork, the stripping is confined to one portion of the tree at a time.

Cork Production.—An axe with a wide sickle-shaped blade is used removing the cork. The sale unit is the "arroba" (32.38 lbs.). Cork is seldom exported in a raw condition, but is usually cut into strips according to classification; these are steamed and flattened after the defective portions have been removed. The pieces ("pranchas") thus prepared are compressed into bales of $59 \times 27.5 \times 23.6$ inches and bound with bands. When bottle corks are made, the sheets are once more steamed and then cut into cubes (quadros); these are trimmed to shape, either by hand with a knife, or by means of a machine. Champagne corks are manufactured in Portugal.

The wine corks of commerce owe their appearance to being placed in a solution of oxalic acid. When needed for other purposes, they are suited to other operations. There are no linoleum factories in Portugal, but the cork refuse can be turned to account. The latter is, however, generally used for floor cement, or is made into insulators.

Amongst the defects that occur in cork, "jaspeada" must be mentioned; this is a dark cloudy discoloration giving a marbled appearance to the cork. Green patches also are to be found, caused by a mould, which generally occurs on the unripe cork; other defects are due to the injuries caused by various insects; those due to the attacks of the *Buprestidae*, *Coroebus undatus*, *Coroebus bifasciatus*, and *Agrius*, and which consist of tunnels bored in the cambium layer, are called "colebra." Ants of the genus *Crematogaster* cause similar damage, while *Tortrix viridana* ("burgo") attacks the leaves and acorns. The best quality of Portuguese cork comes from the districts of Beja, Evora, Portalegre and Algarve.

Cork plantations occupy the following areas:

District of Faro	46 930 acres
" " Beja	145 730 "
" " Evora	187 720 "
" " Portalegre	88 920 "
Remainder of the country	49 400 "
Total	518 700 acres

The annual yield of good dry cork amounts to about 50 000 tons. The total production of cork in Portugal amounts to 58 192 tons (according to the latest statistics), of this about 11 000 tons are consumed in Portugal, while the rest is exported to Germany, Belgium, the United States, Brazil and especially to England. The last country consumes the most prepared corks.

The writer has made a series of analyses of Portuguese cork, as well as of the cork of several species of *Quercus* together with the relative nutritive value of the cork.

LIVE STOCK AND BREEDING.

Investigations on North American Ticks and their Control.

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The first studies made of the life history and habits of the North American Cattle Tick (*Margaropus annulatus* Say) were those of Dr. Cooper (1891, 1892). In 1898 Dixon and Spreull reported studies made of *Margaropus decoloratus*, and the same year Prof. C. P. Lounsbury in Johannesburg began his classic studies of the Ixodoidea; other investigators soon followed with work on several species of ticks and among these Dalrymple, Morgan and Dodson published an account of experiments relating to the North American cattle tick and C. J. Pound published his studies on the Australian cattle tick (*Margaropus australis* Fuller). In Germany, in India, Argentina, Brazil and Jamaica many observations on different species have been made by numerous investigators.

The Bureau of Entomology (U. S. Department of Agriculture) has conducted a course of investigation on all the cattle ticks hitherto found in the United States, and in its Bulletin No. 106 an exhaustive account (including description, host relationship, geographical distribution, life history, economic importance, etc.) of these species of ticks is given. The methods employed in the studies are also given, as well as a series of plates. From an economic point of view, cattle ticks occupy the most important position among the ticks of North America owing to the part they play in the transmission of *Piroplasma bigeminum*, the cause of Texas fever in cattle. It has been estimated by Dr. Mohler (1905) that the cattle tick alone is the source of approximately \$ 40 000 000 (about £ 8 000 000) of annual loss in the United States. Mayer (1906) has estimated the annual loss as nearly \$ 100 000 000 (about £ 20 000 000).

Besides the cattle tick, *Dermacentor venustus* Banks which transmits the causative organism of Rocky Mountain spotted fever, and *Argas miniatus* which transmits a spirochaeta to poultry, are also considered. A good many other North American species, hitherto at best known only as ecto-parasites of man and domestic and wild animals.

Margaropus annulatus lives usually on horses and mules, and on the latter animals, with the exception of those which suffer from Texas fever.

Cattle ticks live only a part of their lives on their hosts, the rest being on the pastures.

The tick larvae attach themselves firmly to the skin of their host where the female larva remains from 21 to 66 days, during which time moults twice (like the male) and becomes a sexually mature eight-legged tick. It then mates with a male living on the same host and gorges with blood, attaining a length of about half an inch, after which it drops to the ground and lays its eggs on the pasture.

Egg-laying begins during the spring, summer and autumn months 2 to 20 days, and during the winter months in from 13 to 98 days, after falling to the ground.

Egg-laying is retarded by low temperatures. It is completed in from 4 days in the summer to 151 days beginning in the autumn. During this time the tick may deposit from a few hundred to more than 5000 eggs. After egg-laying the mother tick dies in the course of a few days.

After a time, ranging from 19 to 188 days, the eggs begin to hatch. From each egg issue small six-legged larvae or seed-ticks which after a few days ascend the nearest vegetation, such as grass, herbs, etc., whence they try to reach a host by means of their long front legs.

The seed tick during its life on the pasture takes no food, and until it reaches a host it dies of starvation. Its endurance, however, is very great, as it has been found to live without food nearly eight months during the colder part of the year.

The United States Congress in 1906 empowered the United States Secretary of Agriculture to inaugurate a plan of cooperation with the authorities of Southern States for the eradication of the cattle tick. The Federal appropriation for the fiscal year 1907 was \$ 82 500 (about £ 16 500) and for 1908 \$ 150 000 (about £ 30 000). Annually since then \$ 250 000 (about £ 50 000) have been appropriated for this object. At first only 7 States cooperated with the Federal Government in the work of tick eradication. Now all the States interested in the question (with only one exception) undertake cooperation with the U. S. Bureau of Animal Industry.

In the eradication of ticks, either the pasture rotation method is used or the ticks are killed by insecticides applied by swabbing, spraying or dipping the cattle.

In the pasture rotation system the cattle are kept between May and September for 20 days in a pasture in which there are no ticks, then 20 days in another such pasture and lastly for again 20 days in a third enclosure; all these pastures must be free from ticks, so as to avoid the cattle becoming infested with the parasites. The ticks (female) previously attached to the animals have in the meantime dropped off from their hosts and die from them so long as they keep in tick-free enclosures. Belgians have grazed first must not be restocked with cattle until all the larvae that have hatched out from the eggs have died of starvation.

The carrying out of this system, however, presents some difficulties, consequently the use of destroying agents, such as oils and arsenic are becoming increasingly common. Arsenical dips are very effective and during the past few years have come into much favour.

HYGIENE OF LIVE-STOCK

33

STATE	Counties infected Aug. 1, 1906	Counties infected April 1, 1911		Counties released up to April 1, 1911		Counties in which eradication is in progress	Square miles released up to April 1, 1911	Square miles infected April 1, 1911
		Whole	Parts	Whole	Parts			
Alabama	67	67	0	0	0	7	0	51 540
Arkansas	75	65	0	10	0	9	7 220	43 825
California	15	3	1	11	1	3	67 977	11 947
Florida	47	47	0	0	0	0	0	54 240
Georgia	144	141	0	3	0	6	815	57 328
Kentucky	2	0	0	2	2	0	841	0
Louisiana	60	60	0	0	0	2	0	45 420
Mississippi	78	73	2	3	2	17	2 032	44 308
Nebraska	4	4	0	0	0	4	0	1 595
Nevada	72	42	0	30	0	8	13 993	23 372
New Mexico	59	52	0	7	0	6	7 890	40 000
North Carolina	42	38	0	4	0	8	2 673	27 497
Tennessee	42	8	4	26	8	6	11 989	17 210
Texas	190	178	5	7	5	11	13 311	178 574
Virginia	38	6	2	24	2	3	11 080	2 838
Total	929	784	14	127	20	90	139 821	601 694

A formula commonly used is the following :

Sodium carbonate	24 to 25 lb.
Arsenic trioxid (white arsenic)	8 to 10 lb.
Pine tar	1 gallon
Water sufficient to make	500 gallons

The cattle and horses are to be bathed in this dip at intervals of more than 20 days until no more ticks are to be found on the animals.

For dipping purposes vats made of concrete are useful, and they in many cases, be built by the cooperation of all the farmers of a community.

Up to April 15, 1912, 162 648 square miles have been freed from tick and this area is separated from the tick infested country by a strict quarantine. (1)

The accompanying table shows the progress of tick eradication.

43- The Tick Problem in south Africa (2).

MOORE, WILLIAM (School of Agriculture Potchefstroom) in : *Journal of Economic Zoology*, Vol. 5, No. 5, pp. 377-384. Concord, N. H., Oct. 1912.

The following is a list of ticks and diseases transmitted by tick South Africa.

Scientific names	Vernacular names	Diseases carried	Hosts
<i>Boophilus decoloratus</i> Kock	Blue tick	Texas cattle fever; redwater; <i>Spirochaetosis</i> .	Cattle, horses, sheep
<i>Amblyomma hebraeum</i> Kock	Bont tick	Heartwater.	Sheep, goats,
<i>Haemaphysalis leachi</i> Audouin	Dog tick	Malignant jaundice.	Dogs
<i>Rhipicephalus appendiculatus</i> Neumann.	Brown tick	East coast fever; gall-sickness of cattle; Texas fever.	Cattle
<i>R. simus</i> Kock	Black-pitted tick	East-coast fever; gall-sickness; <i>Spirochaetosis</i> .	Cattle
<i>R. everts</i> Neumann.	Black tick	East-coast fever; gall-sickness; biliary fever of horses.	Cattle, horses

(1) See No. 21.

(2) See: No. 21, No. 2425, B. Aug.-Sept.-Oct. 1911; No. 146, B. 1912; Nos. 358 and 359, B. 1912; No. 810, B. May 1912; No. 934, B. June 1912.

Besides the ticks which are known to transmit diseases, there are many others which attack domesticated animals. Among these *Ixodes pilosus* attacks sheep, goats, oxen, horses, etc., and is supposed to be the cause of a paralysis of sheep in Cape Colony, and *Hyalomma aegyptium* Linn., Bont-leg tick, may be found in the adult state on all domestic animals, and is thought by some to cause abscesses on the animals. Other ticks whose injury may only amount to tick worry, are *Ixodes rubicundus* Neumann, *Rhipicephalus oculatus* Neumann, *R. sanguineus* (Lat.), *R. lunulatus* Neumann, *R. duttoni* Neumann, *R. bursa* Canestrini & Fanzago, *R. nilens* Neumann, *Amblyomma variegatum* (Fabr.) and sometimes *A. marmoreum* Latr.

The life-cycle of many of the common ticks has been worked out by Theiler, C. P. Lounsbury and C. W. Howard. The eggs of *B. decoloratus* are laid in about five days or more from the time the engorged female drops from the hosts and hatch in from three to six weeks, — in winter a longer period is required. The larvæ may live for six or eight months without feeding. The moult from larva to nymph and from nymph to adult is performed, without leaving the host animal, in about three to four weeks. The eggs of *R. everisi* hatch in about 30 days, and the larvæ can exist for seven months without feeding. The moult from larva to nymph is performed upon the animal in about ten to fifteen days. The engorged nymph drops from the animal and moults on the ground, seeking a second host for adult existence. The adult tick may live for as much as a year, should it find a suitable host; it remains on the host animal from six to ten days. The life cycle of *R. appendiculatus* is typical for *R. capensis*, *R. nilens*, *R. simus* and is given for the group. The eggs are laid by the engorged female in about six or more days from the time she drops from the host animal. These hatch in from 28 days to several months, depending upon temperature. The larva remains on the animal for about three to eight days, after which it too drops to the ground to moult — which is accomplished in about 21 days. The nymph attaches itself to a second host animal and remains for from two to seven days, when it drops off to moult to the adult. The second moult occupies about 18 days. The adult remains on the third host for a period of four to seven days. The larval tick can exist for seven months should it not find a host, the nymph six and one-half months, and the adult nine and one-half months.

H. hebraeum also has a life cycle much similar to *R. appendiculatus*. When hosts are sought, the larva remains on the host for about 20 days, the nymph 4 to 20 days, and the adult 10 to 20 days. It is found on various hosts from the above species in the above manner, and also on various other animals and to hares. The larva remains on the host for about 10 days, but the engorged nymph drops to the ground and moults. The adult remains on the host for about 10 days, and then drops to the ground. *A. marmoreum* differs from *H. hebraeum* in that it is found on oxen. It attacks oxen and goats, while the nymphs of *H. hebraeum* are common upon tortoises.

"Trekkings" and grass burning are old methods, but even yet employed, for ridding flocks or herds of disease.

One of the farmers' favourite summer grazing sections of South Africa is the High Veld. Over this area — lying between 4 000 to 6 000 feet altitude — the ticks which transmit diseases are limited or nearly limited to *B. decoloratus* and *R. evertsi*, due to the fact that the other ticks cannot withstand the winter temperature. In the winter the stock farmers take with their animals to the warm low veld, where the grass is abundant. Their animals become sick from some of the "tick diseases," they trek to the higher country, where the disease would disappear.

By burning off the dry grass, the new green grass comes up much sooner and will furnish grazing for cattle and sheep at a much earlier date. Some farmers noticed that after the grass had thus been burned off, the animals suffered far less from ticks; the practice then came to be adopted against the ticks themselves.

The starvation method of eradicating ticks — which has been so successful in the Southern United States, against *B. annulatus* — has been tried in South Africa, but has not been so effective. Generally here the question is not only the eradication of the blue tick, but also of the brown and red ticks and the Bont tick. In theory even these could be destroyed by placing all the animals in *B* (see the annexed diagram) and keeping them there for a period of 15 months; then transferring the animals to *C* and keeping

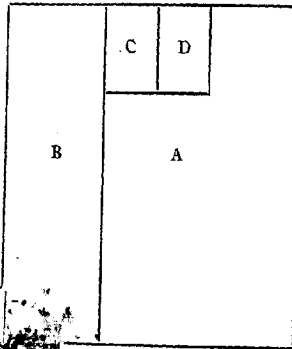


Diagram of land for the starvation of ticks.

them in *B* for 15 months; then transferring the animals to *C* and keeping them in *C* for 18 days; and finally transferring the animals to *D* (so that the time to moult and again moult is 18 days; and finally transferring the animals to *D* and the farm thus freed of ticks. In practice, however, the method in theory is not so simple, as the farm of all the ticks which are known to transmit diseases to cattle, sheep and goats. In practice, however,

starvation of ticks is not so easy, owing to the number of wild animals which will act as hosts to the ticks, thus carrying them over the starvation period. Of those ticks which transmit disease, but two species *B. decoloratus* and *R. capensis* — do not find a host on the wild animals. The wild hosts of the other common African ticks are the following:

Amblyomma hebraeum: lion; wild dog; various antelopes; buffalo; giraffe; ostrich.
Rhipicephalus appendiculatus: lion; various antelopes; buffalo; Cape hare.
Rhipicephalus evertsi: reed buck; various antelopes; giraffe; Cape hare.
Rhipicephalus simus: lion; wild dog; jackal; bush pig; hedgehog.

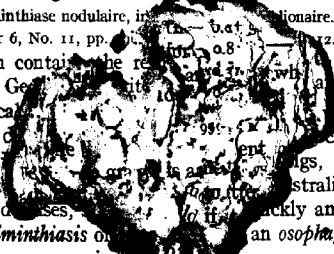
In an actual trial of the starvation method carried out by H. E. Laws in the East London district, it was seen that the blue tick can be starved, also that *R. capensis* seems to have some host among wild animals which has not been observed. Hares and duiker (one of the antelopes) which have been running on the experimental area were tick-infested when shot. The usual and the most successful method employed in South Africa against ticks is dipping. The dipping fluid found most useful is that recommended by Pitchford, which is

5½ lbs. of soft soap;
 2 gals. kerosene;
 8½ lbs. arsenite of soda;
 400 gals. water.

Even dipping has its disadvantages, if the farmer has many species of ticks to destroy. If only *B. decoloratus* is to be destroyed, dipping every six weeks will suffice; if *R. evertsi* is to be destroyed the dipping would have to be done every week; if also the brown ticks (*Rhipicephalus* spp.) are to be destroyed, dipping would have to be done every three days. In order to make dipping every three days possible, the above formula has been modified to: 3 lbs. soft soap; 1 gal. kerosene, 4 lbs. arsenite of soda (20 % nic); 400 gals. water. In farms of over one or two thousand acres, dipping every three days would seriously interfere with any other farming operations; it seems more practical to dip every week and continue the dipping over a number of years.

Nodular, Intestinal and Ganglionic Helminthiasis

BRIMALDI, ERCOLE: L'Helminthiase nodulaire, intestinale et ganglionnaire. — *Hygiène de la Viande et du Lait*, Year 6, No. 11, pp. 101-102, 1912.
 In this article, which contains the results of a study made in the Municipal Abattoirs of Genoa, the author discusses the question of the nature of the disease, called nodular helminthiasis, which attacks a large number of domestic animals, especially deer, being of general occurrence. It is caused by the parasite *Ostophorosus*, and also by *Ostophorosus* spp. It occurs in Europe, Australia and Japan, and, like all parasitic diseases, it is most common among wild animals. The nodular helminthiasis of deer is caused by an *ostophorosomosis* attacks by preference young animals.



The eggs, which are disseminated by infected cattle, when they fall in suitable places, hatch out and the larvæ become free. It is not known whether the latter have an independent life in the ground, or pass into an intermediate host. The eggs are laid at the beginning of autumn and the larvæ at the same season penetrate into the intestines of the animals. Water is probably the vehicle of infection in the case of cattle. This parasitic disease is never found in dry districts, but occurs in those which are irrigated and where the water has remained stagnant for some time. The larvæ, having found their way into the intestine, penetrate the mucous membrane by means of their rapid movements and reach the sub-mucosa, where they usually remain. Some of them, however, traverse the muscle layer and find their way beneath the serous layer, while others penetrate into the ganglia of the mesentery by way of the chyliferous ducts. Having penetrated into the thickness of the wall of the intestines, or below the serous layer, or even into the ganglia of the mesentery, the larvæ cause the formation of nodules, within which they remain for some months. But when those which are in the walls of the intestines emigrate towards the intestinal aperture from June to July, the others never succeed in overcoming the hindrances in their path and perish within the nodules. Having reached the intestine, the parasites differentiate sexually, and eggs are produced; these are expelled with the faeces and set at liberty larvæ ready to infect new hosts. The disease is characterised anatomically by the occurrence of nodules containing a nematode larva, in the course of the intestines and in the ganglia of the mesentery. The lesions of the ganglia have an undoubted similarity to those of tuberculosis and a confusion between the two might lead to very serious consequences. *Bilharzia crassa* also produces a helminthic form of nodule, which differs in its smaller size and its less resistant capsule. The berberle nodules differ from the parasitic ones chiefly in that the former contain more caseous than purulent matter, and are clearly isolated from the surrounding tissues, besides being often surrounded by small tubercles.

The most characteristic symptom of nodular *helminthiasis* is severe diarrhoea, the faeces being greenish and watery; this attacks several animals at once and assumes an enzootic character. The disease lasts about six months, and then gradually disappears; its evolution is slow and progressive. The sick individuals are low-spirited and emaciated; they suffer from pica and sometimes die exhausted by diarrhoea during the cachectic period.

From researches made by the writer on a large number of cattle it seems to follow that the disease is due to an *Osophagostoma* larva.

1. The larvæ penetrate into the intestine in the months of autumn.
2. I have seen the larvæ in the intestines of cattle in Belgium.
3. Some writers, the mesenteric ganglia are the seat of the infection process and also simulate very much the tuberculous nodules.

Wireworms in Sheep and their Treatment.

HEILER, ARNOLD in *The Agricultural Journal of the Union of South Africa*, Vol. IV, p. 4, pp. 372-386. Pretoria, October, 1912.

The writer first describes the development of the wireworm (*Strongylus rhus*) which lives in the fourth stomach of the sheep (1) and sucks nutriment from the mucous membrane (2). The female worm lays eggs which the sheep's body with the droppings. The eggs hatch out at a temperature of 40° to 50° F.; the young worm feeds on the organic matter of manure and reaches the so-called ensheathed form, which withstands influence of cold or dryness. This ensheathed form grows into the adult in the stomach of the grazing sheep, being taken up with the grass. It is thus very necessary that the pastures should be kept free from infestation. To this end, the sheep-breeder must always have at his disposal pasture, on which no sheep or other ruminants have been grazing for at least nine months to one year. If, however, a flock is infected, which is ascertained by examining the sheep manure, the worms must be got rid of by dosing the sheep, and the flock should be driven to a clean pasture. If sheep again show signs of infection, for the parasites are not always killed by dosing, this treatment should be repeated. By adopting this system of dosing and moving on to cleaned ground, it will in time be possible to eradicate the disease.

The grass of the infected pastures should be burnt each time on the removal of the sheep. Where, however, change of pasture and burning the grass are impossible, the repeated use of vermicides is the last resource. The two best known medicines for dosing sheep are bluestone and Cooper's Dip and lately they have been used in combination. The results of a series of experiments as to the safe maximum dose of this mixture can be summarized as follows:

For sheep from 4 to 8 tooth: 15 grains of Cooper's Dip and 15 grains of bluestone.

For sheep of 2 tooth: 10 grains of Cooper's Dip and 10 grains of bluestone.

For lambs from five months old: 7½ grains of Cooper's Dip and 7½ grains of bluestone.

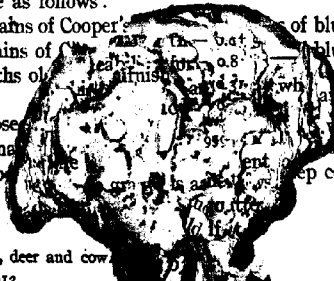
Experiments proved that smaller doses were effective and accordingly the following doses recommended were as follows:

For sheep of 4-8 tooth: 10 grains of Cooper's Dip and 10 grains of bluestone.

For sheep of 2 tooth: 7 grains of Cooper's Dip and 7 grains of bluestone.

For lambs, six to nine months old: 5 grains of Cooper's Dip and 5 grains of bluestone.

It was found that one dose of the mixture was sufficient to kill the worms; further experiments were made at intervals of three weeks, and the remedies could safely be repeated.



It also occurs in the goat, deer and cow.
See No. 1544, B. Nov. 1912.

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dosed ten times at weekly intervals with the maximum safe dose and freed from the parasites. This also applied to lambs.

Further experiments were made as to the effect of the above-mentioned remedies: 30 pregnant ewes were given, from some days up to some weeks before lambing, the whole or the half of the maximum dose; this was followed (in two instances where twins were born) by the death of the twins. This may be due to the actual dose, since in one other instance where the twins survived, the ewe had only been given half the safe dose.

The dosing of ewes with the maximal dose of Cooper's Dip and bluestone, given on the day of lambing or some days after, had no bad effect on the suckling lambs.

A second method of dosing sheep is by placing a lick of bluestone, Cooper's Dip, slaked lime, sulphur and salt in troughs to which the sheep could have free access. Although they each consumed on average 10 grains of Cooper's Dip and 2.3 grains of bluestone daily over a period of 12 months, these remedies had no effect in improving their condition. Direct dosing with the mixture is preferable to the use of the lick method.

Other remedies are "Kamala", a medicine which is at present being tested, and "Bert Bowker's Powder": this, according to the farmers, is said to have the desired effect.

46 - The Action of Anthelmintics on Parasites located outside of Alimentary Canal.

RANSOM, BRAYTON HOWARD and HALL, MAURICE C.: U. S. Department of Agriculture, Bureau of Animal Industry, Bulletin No. 153, 23 pp. Washington, 1912.

This paper gives a systematic summary of all previous work concerning the use of anthelmintics against parasites located outside of intestinal lumen, and also details the results of some attempted medicinal treatment of sheep for tapeworm disease (*Chysanosoma actinostomum*). From the literature quoted, it appears that anthelmintics have been claimed to be efficacious in 8 cases of human somatic taeniasis (male fern); inefficacious in 8 cases of somatic taeniasis in the lower ant (male fern); inefficacious in at least 6 cases of intestinal and extraintestinal thysanosomiasis (carbon bisulphide and male fern); efficacious in 14 cases of hepatic distomatiasis (carbon bisulphide and male fern); efficacious in 5 cases of hepatic distomatiasis (salvarsan); inefficacious in 5 cases of hepatic distomatiasis (male fern); and efficacious or inefficacious in a definite number of cases of distomatiasis (male fern). The authors based on a critical examination of the cases collected here indicates that the figures; on the other hand, their collection of cases of carbon bisulphide and male fern) was negative. The authors conclude that the collection here indicates further work is desirable. (A bibliography is appended).

New Feeds and their Value for Agriculture.

HONCAMP, F.: Neuere Futtermittel und deren Wert für die Landwirtschaft. — *Mitteilungen der Deutschen Landwirtschafts Gesellschaft*, Part 46, pp. 635-638. Berlin, Nov. 16, 1912.

The following is a report on the results of experiments carried out by writer on the feeding and fattening of live stock at the Rostock Experiment Station, with the object of determining the value of foods recently upon the market.

Dry Beer Yeast. Delbrück calculates that the German breweries turn every year about 70 000 tons of fresh yeast which hitherto were more or less allowed to run to waste.

Air-dried yeast contains from 40 to 45 per cent. of raw protein; it is consequently a concentrated vegetable food rich in proteids which might find useful employment as complementary food in the fattening of pigs.

For drying beer yeast there are a number of apparatus of the usual type; vacuum drying has also been attempted, and this would have the advantage of requiring lower temperatures and consequently avoiding side alterations which diminish the digestibility of the albuminoids.

In the writer's experiments sheep utilized, in their maintenance experiments, from 89 to 93 per cent of the proteids contained in the dry yeast; the same coefficient of digestibility may be admitted for pigs also. Fattening experiments carried out with sheep and with growing pigs have shown that for sheep, dried yeast as a complementary proteic food had the same value as a mixture (of equal starch and proteid value) of cotton-meal and sesamum cake as well as oil-free soy cake. Similar results were obtained with pigs which were fed dry yeast in comparison with meat meal. These experiments will be repeated. As for cows, the writer reports that they refused all food containing even small quantities of dried yeast. The price of this substance is not high: from 8 to 9 shillings per cwt.

New by-products of oil making are: *Guizotia oleifera* cake (Nigerkuchen)

Perilla cake; according to the writer the former contains in its dry matter about 36 per cent. of crude protein and 6 per cent. of fat; the latter 41 per cent. of protein and 8 per cent. of fat. The digestibility is respectively 87 and 91 per cent. for *Guizotia* cake and 87 and 88 per cent. for *Perilla* cake. These figures are approximately the same as those of other oil cakes. Hansen fed *Guizotia* cake to sheep and found that their nutritive action was not good. *Perilla* cake, however, and *Perilla* are made from small hard seeds, which require high steam pressures for which they are not well adapted. It is probable that they should gain a footing in the market if sold at a low price.

The dry matter of ryegrass contains 15 per cent. of protein and 1.7 per cent. of fat; wheat straw 10.5 per cent. of protein and 7.8 per cent. of fat. Of the protein of the straw 90 per cent. was digested by sheep and 90 per cent. by pigs; of the fat 70 per cent. respectively. Sheep digested 89 per cent. and pigs 90 per cent. of the crude fat



of wheat germs, while the respective figures for rye germs were 90 and per cent. They are thus feeds rich in albuminoids and especially easy digestion, and much relished by all kinds of live stock. Wheat and rye germs are not usually found separately, but pass together with the bran into the siftings. When however they are isolated, they can be advantageously fed fresh, that is before being allowed to become rancid, to all kinds of live stock as complementary albuminoid food.

Among the foreign pulse that has recently appeared on the market the following may be mentioned: the Calcutta-pea (*Kalkutta erbse*), chickpea (*Cicer arietinum*) and the chickling vetch (*Lathyrus sativus*). The two latter were considered poisonous, but this view seems to have been contradicted by the present observations and experiments, at least the chickpea, while the chickling vetch might under certain conditions be poisonous. It is perhaps something similar to what happened about 18 years ago with lupins, which on being fed produced widely spread disease, so-called "lupinosis", that for several decades past has not reappeared.

The writer has instituted experiments on the digestibility, on the part of animals, of these various kinds of pulse. Digestive tests *in vitro*, have given the following percentages of digested protein:

Native beans	95 per cent.
Chickpeas.	93 "
Chickling vetch	90 "

The use of chickling vetches appears, at present at least, not to be advisable, and according to practical men chickpeas should not be fed to horses in which they seem to cause broken-windedness.

The so-called molasses feeds in general consist of substances possessing very little or no nutritive value, mixed with molasses. In order to prevent the trade in these feeds, the special legal tariff No. 3 allows only those molasses feeds in which molasses is mixed with only one explicitly declared substance. Among the absorbents recently used, there is solubilized sawdust, that is sawdust treated with sulphuric acid under pressure in order to transform the lignin and cutin into dextrose (20 to 25 per cent), with the object of rendering it more palatable; it is fed warm and mixed with a certain quantity of warm molasses. It was stated to have a high nutritive value, but the author's experiments have not confirmed this. The writer on the dry matter yielded the following results:

	Crude Fat per cent.	Crude Fibre per cent.	Ash per cent.
Crude sawdust	25	68.64	0.60
Solubilized sawdust	20	57.33	0.70

thus showing that the treatment does not modify the composition of the sawdust to any great extent. Nevertheless a portion of the cellulose is transformed into dextrose, and there is a decrease of crude fibre and increase of nitrogen.

extract). The writer therefore conducted some experiments with view of ascertaining how these sugars were utilized by animals.

The results of his experiments tallied with those of other previous investigators, and showed that crude sawdust, besides not being utilized, really diminishes the digestibility of other feeds mixed with it. Solubilized sawdust does not come up to the level of the straw of winter cereals, and when mixed with molasses ("bastol") its digestibility is practically nil. The price demanded for solubilized sawdust is 8 shillings per cwt. grossly exaggerated price.

It has been also suggested to mix sawdust with warm distillery by-products, but even this method does not yield utilizable feeds. Some years ago pine needles from which the resinous and tannic substances had been extracted were suggested as an absorbent for molasses. But experiments carried out then by the writer with maintenance rations showed that even the degree of digestibility of natural and exhausted needles there was no sensible difference. Recent experiments conducted by W. Schneider on sheep with fattening rations fully confirm the above results.

Lupins, on account of their bitterness, are not palatable to live stock, with the exception of sheep. The usual methods adopted to eliminate bitterness are not economic. Herr H. von Fehrentail has constructed an apparatus in which the lupins are first steamed in a Henze vaporiser, mixed with potatoes, then crushed and dried between hot rollers. According to analyses made at the suggestion of the writer, the percentage of "lupin flakes" was the following:

Crude Protein	Pure Protein	Nitrogen-free Extract	Crude Fat	Crude Fibre	Pure Ash
30.80	28.55	49.40	2.69	12.94	4.17

which the following percentages are digestible:

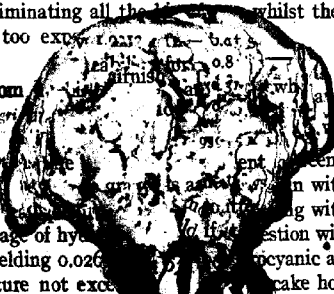
Protein	Nitrogen-free Extract	Crude Fat	Crude Fibre
86	94	73	91

It is therefore a highly digestible product; but not even Fehrentail's apparatus has succeeded in eliminating all the bitterness, whilst the process of drying is perhaps still too expensive.

Hydrocyanic Acid from Linseed

The Journal of the Board of Agriculture, London, November 1912.

1. *Feeding Experiments.*—The writer has been conducting experiments on the effect of feeding linseed with a view to determining the effect, if any, of the hydrocyanic acid on the yield of a high percentage of hydrocyanic acid, cake hot-pressed. A parcel of linseed, yielding 0.026 per cent of hydrocyanic acid, cake hot-pressed, at a temperature not exceeding 100°C., was



at a temperature of 160° F. were prepared. The cold-pressed cake yielded on treating with water — 0.038 per cent. of hydrocyanic acid. This cake was fed to a heifer, 14 lb. being given each day for eight consecutive days but no ill effects were produced on the animal. Another heifer was fed on the hot-pressed cake, yielding 0.032 per cent. of hydrocyanic acid. This heifer also received 14 lb. of cake per day for eight consecutive days and no ill effects resulted.

The above rations are very much larger than would ordinarily be given and the linseed cake contained an exceptionally high percentage of hydrocyanic acid.

2. *Effect of Heat on the Ferment giving rise to Hydrocyanic Acid in Linseed.* — In the case mentioned above, nearly the same amount of hydrocyanic acid was obtained from the hot-pressed cake as from the cold-pressed cake on digestion with water. This result was contrary to the generally accepted view that the activity of the ferment in the linseed, known as cyanogenetic glucoside, is destroyed by the heat applied in expressing oil during the hot-press method of preparing linseed cake. It appears desirable, therefore, that further samples should be examined in order to ascertain whether hydrocyanic acid corresponding in amount with that present in the original linseed is produced by digesting hot-pressed cake with water. The following results were obtained:

From parcel of Linseed	Seed or Cake	Percentage of Hydrocyanic Acid	Total Nitrogen per cent.	Ratio. Hydrocyanic Acid to Total Nitrogen	Seed from
No. 1	Seed . . .	0.013	3.50	0.0037	La Plata
	Cake . . .	0.026	5.00	0.0052	"
No. 2	Seed . . .	0.020	3.35	0.0060	Baltic
	Cake . . .	0.027	4.85	0.0056	"
No. 3	Seed . . .	0.018	3.21	0.0056	La Plata & Calcutta
	Cake . . .	0.030	4.69	0.0064	"
No. 4	Seed . . .	0.020	2.84	0.0102	Calcutta
	Cake . . .	0.027	4.22	0.0116	"
No. 5	Seed . . .	0.020	3.35	0.0084	"
	Cake . . .	0.027	4.85	0.0102	"
No. 6	Seed . . .	0.020	3.35	0.0070	"
	Cake . . .	0.027	4.85	0.0109	"

A direct comparison of the percentage of hydrocyanic acid yielded by the seed and cake (column 3 of the above table) is within value, as the result of the fermentation from the seed is to increase the proportion of the remaining in the cake. In order to ascertain whether

any change has taken place in the activity of the enzyme in regard to production of hydrocyanic acid, a comparison may be made between ratios of the hydrocyanic acid to some other constituent, as, for example, nitrogen. Column 5 shows that, except in one case, this ratio is higher, indicating a greater production of hydrocyanic acid in the than in the original seed. The apparent increase may probably be due to the under estimation of the hydrocyanic acid in the seeds, owing to the difficulty with laboratory appliances in breaking down the body of the seed as thoroughly as it is done under the heavy rollers of an oil mill. The results fully confirm those given above.

In a paper published in the *Journal of the South Eastern Agricultural Society* (No. 20, 1911, p. 289) Dr. Auld states, with reference to the examination of a large number of oil cakes, that in no case was a diminished rate of production of prussic acid noted in cakes of lower oil content which might be assumed to have been pressed at a higher temperature or kept under the influence of heat for a longer period. This statement tends to confirm the results.

Supply of Store Cattle and Slaughter of Young Cattle in Great Britain.

Journal of the Board of Agriculture.—Vol. XIX, No. 8, pp. 617-623. London, November 1912.

The problem of the rise in the price of store cattle and the extent to which young calves are slaughtered has already been dealt with in the *Journal* for August, 1911 and for April, 1912.

The statistics published by the Board of Agriculture show that in the period from 1906 to 1910 the average price of stores rose by about one-seventh.

Exact figures showing the number of calves slaughtered each year are not available, but there is no doubt that, leaving out of account purely foreign breeds, such as Ayrshires and Jerseys, the proportion slaughtered of the number reared is very considerable.

It is sometimes suggested that the rise in the price of stores is due to a general falling off in the supply; this, however, is clearly not the case, leaving out of consideration the abnormal year 1911, the number of calves slaughtered in Great Britain has on the whole steadily increased in the last few years, while the number of calves reared in Great Britain, other than for heifers in calf or in milk, has decreased.

As is shown by the following figures, the proportion of calves slaughtered of the total number reared in Great Britain has increased in the last few years, and the proportion of calves slaughtered of the total number reared in Great Britain has increased in the last few years.

At first sight, it seems reasonable to suppose that the increase in the price of calves has not resulted in any increase in the supply. The fact, however, is not a simple one, and it is complicated by the fact that in Great Britain the cattle industry is divided into three classes: 1) farms, on which a large number of calves are reared; 2) rearing farms (having a small area of land, which

Year	Average for English Fat Cattle (1st Quality Shorthorn Type) per 14 lb. stone			Average for G. Brit. Stores (1st Quality Shorthorn Type) Two-year-olds per head	
	£	s.	d.	£	s.
1906	0	7	6	13	0
1907	0	7	10	14	1
1908	0	7	11	14	10
1909	0	8	2	14	7
1910	0	8	7	14	16
1911	0	8	2	14	4

is not good enough for fattening), on which calves — both home-bred and purchased, are reared, but not fattened; 3) fattening farms, where purchased store cattle are fattened.

While this general division is to a great extent necessitated by rural conditions, it is possible — in the writer's opinion — that the specialisation is in many cases unnecessary or carried too far.

In order to attain success in rearing, it is essential to obtain the right kind of calf; whereas at the present time, even in the dairying districts of Cheshire and the North of England, where a good class of Shorthorn cow predominates, many calves of a decidedly poor type are bred on to the use of inferior bulls. Generally, such calves have to be sold in large numbers every spring for immediate slaughter. On the other hand, animals known to be well-bred are always easily sold, and as a rule the demand for such is much greater than the supply.

Another obstacle is the fact that the farms adapted for the rearing of calves are very often at considerable distances from the dairying districts.

The writer gives the following suggestions as a help to the solution of the complicated problem:

1. Dairying. — It is a good general purpose cows, such as Shorthorns, Lincolns, and North Devons, could in most cases be used for their calves if they used better bulls than at present. Even where the best cows are reared, a system of co-operation between the use of two or more herds, or the use of bulls of which the Shorthorn herd an Aberdeen Angus bull, or a Shorthorn bull, would practically all be black and red, and would be selected entirely for sale.

2. The cold and discomfort of a long journey, along with the sudden often violent change of food, tends to induce scour (ordinary scour) other troubles, and such calves often receive a serious check from which recover very slowly, if at all. The difficulty would be greatly lessened, if calves were kept for a couple of weeks before being sent away. Still it could be done by proper treatment of the calves when they reach destination. One of the best methods adopted by successful rearers give a small dose of castor oil and some stimulant in a little warm milk, soon as the calf arrives, and after an hour or so to give a small meal of

For the first few days the calf should receive very small quantities of food at a time, and should be fed at least four times a day. If the least of scour appears, a dose of castor oil should be administered at once, quantity of food reduced by one-half, and a little chalk given. (It is a good plan to leave a lump of chalk in the calf house, so that the calves lick it as they like).

The plan of selling young calves in markets and auctions must be strongly deprecated. Rearers might combine and after inspection of the cows arrange terms and safeguards, agree to take the whole of the available calves from a dairy farmer or from a group of dairy farmers, in which case rearers could have a voice in the selection of a bull.

"This is a problem well worthy of the attention of farmers' clubs and associations, and if any such feel disposed to go into the question, the Board would be pleased to advise as to what other societies it might be desirable to approach, and to do all they can to facilitate attempts to get into direct communication."

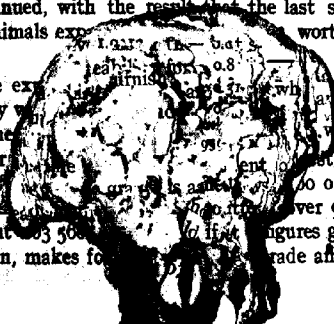
The Exportation of Zebus from Madagascar.

DUZÉ, ANDRÉ. L'exportation des Zébus de Madagascar. *L'Agriculture Nouvelle*, Year 22, 1124, pp. 1051-1053. Paris, November 2, 1912.

Madagascar possesses large herds of native Zebus: the official statistics show those included in the census at 4 500 000 head.

The legs of these animals are very slender and their coat variable. They have very long lyrate horns, wide at the base and with slightly tufted rings. Since the end of 1909, it has been attempted to export for the French market, and in spite of the difficulties incurred at the scheme was continued, with the result that the last statistics show the number of these animals exported worth about 100.

At the same time, the exportation of Zebu oxen has been maintained or stored meat. A factory was established at Antananarivo, which has been working for nearly two years with some success. The Antogobato factory near Antananarivo has been established, slaughtering in one season alone, 100 oxen. The exportation of this meat has been over 913 tons in 1911, at a value of about 103 500 francs. The figures given for the exportation of live oxen, makes for a trade amounting to 110 000,



April and May are the best months for dispatching live zebu, in this date the animals have had time to recover from the winter, the voyage through the Red Sea is less trying, while the cattle in France when the cold is over.

The following figures are the results of data furnished by well-informed colonists and the Butchers' Syndicate. They show the probable profit to be derived from this trade.

A live zebu of 990 lbs., with a dead weight of 440 lbs., is worth the spot, £2 11s. 6d; to this must be added:

	£	s.	d.
Lading dues.	7	11	
Wages of drover.	4	9	
Cost of transport and food.	4	19	2
Disembarking at Marseilles.	4	9	
Total	5	16	7

The cost price at Marseilles will be £2 11s. 6d. plus £5 16s. = £8 8s. 6d. The hide pays for the slaughtering. At 5. 84d. per lb. of this zebu will fetch 440 X 5. 84d. or £10 14s. 1 1/2d., i. e. £2 6s. 0 1/2d. profit per head, from which must be deducted losses on route, thus leaving about £2. The present cargoes consist of 1200 head, so that the profit of each voyage is about £2400 with a capital engaged of £10 000.

51 - Researches on Diphtheria in Fowls and its Connection with Diphtheria in Pigeons and with Fowl-pox.

1. BORDET, J. La diphtérie des pigeons.
2. BELEGH, L. v. Ueber die Beziehungen zwischen Geflügeldiphtherie und Geflügelpocken. — *Centralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten*, Abteilung Originale. Vol. 67, Part 1-2, pp. 41-43; 43-50 + 2 pl. Jena, November, 1909.

I. — Dr. Bordet, Director of the Brussels Pasteur Institute, has already described, in collaboration with Fally, in 1907 (*Bulletin de la Société Royale des Sciences Médicales et naturelles de Bruxelles*, Juin 1907) and in 1910 (*Annales de l'Institut Pasteur*, Juillet 1910) the micro-organism causing diphtheria in fowls, which is distinguished for its extreme smallness, being the smallest that has ever been cultivated. It was discovered in cultures in fowls, by means of scratch plates, and is the typical disease, and the chronic lesion consequent upon this infection is being explained — according to Bordet, Belgium, — as being explained — according to certain whether diphtheria in pigeons was caused by the same organism.

Researches on the special difficulties because the disease is so small, and it is generally limited to the mouth, or the folds of the conjunctiva, and it can

be communicated to other subjects by means of inoculation with a natural virus. This is therefore only very slightly virulent; frequently its cultures are still less so. In fact the writer did not succeed in causing the disease in pigeons by scratching the culture in the lesions; nevertheless, considering that the micro-organism is found pure in great numbers in the lesions; that it is absolutely identical to that of fowl diphtheria; that on the other hand inoculations of pure cultures of the virus from fowls have caused the typical disease (in the writer's previous experiments) and that this virus has been found pure in the lesions thus produced; lastly that both fowl and pigeon diphtheria present symptoms very resembling each other, the writer considers it evident that the recently obtained is the agent of diphtheria in pigeons.

The paper includes a description of the micro-organism in the lesions in the artificial culture media and of the methods of culture.

2. — Fowl-pox has been believed by some to be connected with smallpox, though it is not yet known if this belief is justified or not. The writer however has succeeded in causing the phenomena of fowl-pox by means of the virus of sheep-pox: a connection between the virus of fowls and that of mammals may thus be supposed to exist. The writer summarises the opinions on this subject of several authorities and then describes his etiological investigations and physiological observations, according to which he confirms the fact that the virus of sheep-pox can give rise in fowls either to this disease or to diphtheria while the diphtheria virus can also produce fowl-pox. He concludes that:

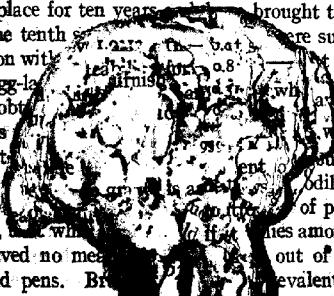
1. The diseases known under the names of fowl diphtheria and of fowl-pox are etiologically identical.
2. The pathogenic agents are the corpuscles described by Borrel, *Cytoplasma avium* Borrel, which may be included among the protozoa.

The paper is accompanied by an appendix of the bibliography containing 23 works.

Egg-Laying Competitions at the Hawkesbury Agricultural College.

Jameson, D. S. in *Department of Agriculture New South Wales, Farmers' Bulletin*, No. 57, 15 pp. 1912.

These competitions took place for ten years and have brought to light many interesting facts. In the tenth year the birds were supplied with animal food in conjunction with the usual food. It was found to the advantage in inducing egg-laying, and the number of eggs obtained in the autumn, the pullets were given this addition to their food. In the summer, the meat-fed fowls proved themselves to be more productive than those which were given no addition. There was no appreciable difference in the weight of the pullets; it was noteworthy, however, that the meat-fed fowls among the Leghorns, which received no meat, were found to be equivalent to the corresponding meat-fed pens. But the meat-fed fowls were found to be equivalent to the corresponding meat-fed pens.



in previous competition, showing that greater egg-productive development lessens the tendency to broodiness.

The whole series has been carried out on essentially practical lines. The morning meal consisted of bran and pollard mash; twice a week, the mash was scalded with liver soup and the minced liver and soup mixed with bran and pollard. This is not only valuable for its protein content, but also as a tonic and appetiser. In the afternoon, grain was fed, wheat predominating, but maize was fed more frequently in cold weather; it was also given a week as a change. Green food was fed in the shape of rape and lucerne.

In the case of good layers of Leghorn breed, it may be advantageous to keep them into the third year, but any way they should be sold on the first of moulting in their third season. The third year Leghorn hens show a wonderful record namely a total of 1013 eggs and this breed proved to be the best for egg production. The average number of eggs laid annually by one hen rose from 130 at the commencement of the experiments to 210 at the close of the ten years. During the three laying periods of a 10-year-old fowl, the number of eggs produced gradually decreases.

Meat feeding was tried in the case of the ducks and with good results.

The health of the birds was extremely good, showing a lower mortality than the average of the ten tests; the general average being 6 per cent. No cases of infectious or contagious disease occurred.

53 - Stocking Trout Streams.

HERRMANN, W. — Zur Besetzung der Forellenbäche. *Allgemeine Fischereizeitung*, XXXVII, No. 23, München, December 1, 1912.

Mistakes are very often made in the choice of material for stocking trout streams, other *Salmonidae* being frequently mixed with the trout. In order to pay well, trout-streams should be devoted to the breeding of this latter species alone, with the addition where possible of char. The type of the individual stream should be taken into consideration in the selection of the trout to be introduced.

From this standpoint, the writer distinguishes three kinds of trout streams:

1. The typical trout stream with crystal-clear water flowing rapidly over its pebbly bed and with scarcely any plants growing here. Here the brown trout (*Salmo trutta* L.) thrives and it would be a mistake to introduce the grayling (*Thymallus* L.) or *Trutta iridea*, which soon become extinct. In such streams the water, soft bottoms and with few weeds, is more varied, and the bottom is here more varied, growing with plants as the Moosach-trout, as exposed by the Belgians. In the first type of stream the trout is the only fish. In the second type of stream with a moderate and thick growth of plants, the trout is the only fish. The excess of food present is due to the plentiful supply of animal organisms, the trout, which fall into the water, and to the trout. Such streams are full

but trout-breeding is much hindered by the presence of less valuable fish, such as roach and perch. The further increase of such species must be prevented by systematic clearing. Often in these cases, recourse must be had to artificial stocking with trout, and a rapidly growing species such as the Moosach-trout is to be recommended. Further, minnow, barbel and perch deserve recognition as non-migratory fish. *Trutta iridea* can be bred at the same time as these species, for there is a plentiful supply of food and this fish will contribute to the catch and lengthen the fishery season. The breeding of brook-trout must not suffer in any way, provided roach, perch and pike are exterminated.

FARM ENGINEERING.

The Use and Cost of Electricity in Agriculture.

REYSERLINGK (von). Ueber Verwendung und Kosten der Elektrizität in der Landwirtschaft.

A Lecture given at the third general meeting of the Silesian Vereinigung für Wirtschaftslehre des Landbaues in Breslau, May 8, 1912. — *Archiv für exakte Wirtschaftswissenschaften*, Vol. 4, Part, 3, pp. 432-441. Jena, 1912.

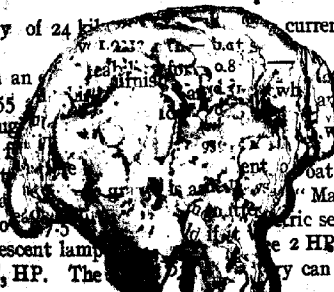
The writer gives in the first place a clear explanation of the expressions and terms used in electro-technique, such as energy, power, metre-ramme, horse-power, ampère, volt and kilowatt-hour.

Then he enters into a description of some agricultural undertakings which have been provided with electricity. The estate of Wilkau, which consists of 3642 acres of arable land and pasturage, and possesses livestock including 170 cows, 200 pigs, 40 horses and 60 draught oxen, has had since 1900 an electric plant with a dynamo with an output of 6.5 kilowatts and driven by about 11 HP.

The necessary force is supplied by a steam engine, which by means of a belt drives also directly a chaff-cutter, a mill and a grindstone. The electric plant consists of 57 incandescent lamps, 2 arc-lamps, a 6 HP. motor for the dairy, a 1.2 HP motor for the water pump, and a portable motor of $\frac{1}{2}$ HP.

An accumulator battery of 24 cells is used to store up current when the steam engine is not running.

The second estate with an area of 2655 acres, which has 23 horses and 36 draught oxen, obtains its power from a steam engine which by belt drive works on a shafting which by belt drive works on a roller, a "Mammut" for crushing grain, a chaff-cutter, as well as a dynamo with 5 HP. There are 140 incandescent lamps and a portable motor of $\frac{1}{2}$ HP. The steam engine can produce 1000 watt hours.



The Guckelwitz estate has a workable area of 1942 acres, and cows, 13 horses, and 48 draught oxen.

Here there is also a central electric station consisting of a dynamo of about 15 kilowatt performance, which is directly coupled with a DeLaval motor of 20 HP maximum power. The secondary plant consists of incandescent lamps, 5 motors, of 3, 12, 11, 4 and 3 HP, together with a portable ½ HP granary motor.

The three estates of Klettendorf, Bettlern, and Lohe are connected with the Klettendorf sugar factory central electric station.

The Klettendorf estate includes a workable area of 2949 acres, keeps 160 cows, 32 horses and 54 draught oxen.

It receives a continuous current with a tension of 110 volts. The secondary plant includes 85 incandescent lamps, a 22 HP motor as well as a 9.5 H.P. motor and a portable $\frac{3}{4}$ HP motor.

The Bettlern and Lohé estates, on account of their distance from the sugar factory, have a polyphase electric installation. The current is supplied to the estates with a tension of 5000 volts and there transformed to the required tension of 210 volts.

The electric plant of Bettlern, which estate consists of 30% of workable land and possesses 205 cows, 36 horses and 50 draught oxen, includes 153 incandescent lamps and 6 motors of 25, 7.5, 5, 1, $\frac{1}{2}$, and $\frac{1}{4}$ HP.

On the estate of Lohé (workable area 2104 acres; live stock: cows, 23 horses, 26 draught oxen) there are 118 incandescent lamps, 6 motors of 32, 10, 4, 2, 1, $\frac{3}{4}$ HP. After describing these 6 electrical plants, the writer turns to the question of their cost.

The instalment cost at Wilbau was £563 10s., at Piskorsine £1491 at Guckelwitz £2205; at the three estates of Klettendorf, Bettlem, and Lohé (which have no primary station of their own) the expense £367 10s., £980 and £ 739 18s. respectively, without reckoning the cost on alterations, or building. The cost of working the electric machine amounted on the three estates which have their own primary stations, each requiring the service of a thoroughly trained mechanic, to £631 and on the other estates to £24 10s. per annum per estate.

The expenses of grease, cleaning and repairs were £15 17s 6d. The cost of fuel was £39 4s. per estate.



ant £147
 £48
 £39. 48
 The Belgians are
 £240
 £147
 £122

without inter

Through the electric-meter the following amount of current was recorded as used per annum:

At Wilkau	about	5 000	K. W. hours
At Piskorsine	"	5 500	" "
At Guckelwitz	"	16 000	" "
At Lohe	"	16 000	" "
At Klettendorf	"	24 000	" "
At Bettlern	"	28 000	" "

The reason of the great difference in the amount of electric force is that at Wilkau and Piskorsine, the engines requiring most force are not driven directly by electricity while at Guckelwitz and on the other estates direct electric force is used for all the engines. Further, Klettendorf and Bettlern also drive the grain crusher, oat roller and the crusher belonging to two other neighbouring estates. For this reason the cost of the single kilowatt hour, also in Wilkau and Piskorsine, can only be accurately estimated if it is known what part of the expense incurred by the engines which were directly driven without electricity. At Guckelwitz the average annual cost of the kilowatt hour, in the last years, *exclusive of interest and amortisation* was, 1.2d.

This sum per kilowatt-hour represents the expense of a modern electric primary plant suitable for such an estate at the present time. If it is considered that the cost of the interest on the capital and amortisation of the plant, is not included and that it is not always so sink much capital for many years in installing an electric plant, the above figure may probably be considered as affording data for estimating the price of a current supplied from a central station by overhead conductors.

The writer adds to these figures other observations.

If threshing could be performed by electricity at Guckelwitz, the cost of the kilowatt-hour would be lower, for the annual consumption of electricity would be considerably increased without raising the working expenses. On the other hand, the expenses of interest and amortisation would not rise, so that the whole cost of the plant would remain unchanged. As in Guckelwitz, the motor only drives the dynamo, and all the other machines are driven by separate belts, the advantage is that each machine can be driven separately, without incurring the loss of the belt.

The writer considers that the electric driving uses little fuel, is self-repairing, and is much more satisfactory than the steam engine.

Electric threshing machines are much smaller than the central electric ones, the Diesel-motor and the steam engine are nearly twice the usual size, which results in a large saving in interest and amortisation.

If it is required to drive a modern threshing machine with pneumatic straw stacker (a 63 inch fan drum; hourly performance about 40 c) by electricity and make the straw into bales by means of a straw baler at the same time or to chop it and to stack it with a pneumatic chopper on the spot, a motor of at least 30 HP must be selected. To drive a "Mammut" threshing machine of about 40 to 50 tons performance daily, a motor of at least 80 HP is required, if the straw is to be pressed or chopped at the same time. For the motor power must be equal to the greatest demands which may be made on it, in order that there may be no interruption of the work. Assistance may be afforded by providing the motor with a fly-wheel; this, like the heavy port of the steam-engine when in motion, more or less counterbalances the unavoidable sudden variations in the power required during threshing operations.

The question whether threshing by electricity when attached to overhead conductors to a central station is preferable to threshing by steam, must be decided on the merits of each individual case. The answer depends upon different circumstances: e. g. the amount of steam available for threshing, the expense of the electric conductors and whether the steam-threshing plant is new or not.

Portable motors are much to be recommended for driving winnowing machines, sorters, grindstones, machines for making straw ropes and any other machines which do not require much force. The use of apparatus for starting or stopping motors to drive water-pumps, by means of floats in the tanks which automatically throw them into or out of gear and thus make the pumps self-acting, is also very advantageous.

With regard to the systems of lighting, arc lamps entail a good deal of work, and as on a farm the suitable staff is usually lacking, incandescent lamps are better.

All lamps should be distributed as well as possible and the switches should be placed in easily accessible places.

The best switches are those with patent keys, as they can only be used by the person whose duty it is to turn the light off and on. In large stables multiple switches are to be recommended. In order to lengthen the working time in the winter and autumn months, the barn should also be lighted at night. A lamp of high candle power should also be affixed to the floor, in order that the mechanic may have enough light to get to the engine.

All the lamps should be of the same kind, which electric lighting affords, are, according to the author, not very high price. The expense of lighting a Belgian farm by means of petroleum and spirit amounted on an average to 1.50 francs per acre, in the case of twelve estates where the workable area was 24 172 acres. Where electricity was used in addition to oil the expense was 0.58 francs per year and acre (workable area 16 360 acres).

in the six last estates, the cost of the electric lighting only amounted of the total expense of illumination of 1.8d. per year and acre has should only have amounted to 1.22d.; in reality, however, the was about 2.45d. per year and acre.

Adding to this the 0.58d. expended on petroleum and spirit on the estates where electric light was used in addition, the total lighting expense per year and acre (not including interest and amortisation) was 3.03d.

It can therefore only be decided upon the merits of each separately whether the advantages offered by electric lighting justify the additional expenses incurred in its use, and further, whether electric light alone can be employed or electricity also be used as the source of power.

The electric motor possesses the great advantage of fulfilling all the requirements for driving machines and of doing this in a more satisfactory manner and with less expense for reconstruction or building than is aided by the use of any other engine. Also it needs very little maintenance.

The writer had only negative results in the electric plough experiment which he carried out in 1902, on account of the loss in the connections current conductors and because the motors used were not sufficiently powerful.

Since that date, however, much progress has been made in electrical engineering, on the one hand from the use of high tension polyphase electric currents, and on the other hand from motors having been devised which correspond to the actual needs of ploughing operations.

RURAL ECONOMICS

The Capitalization Value of Real Estate.

DR. ERNST: Der Ertragswert der Liegenschaften. — *Führlings Landwirtschaftliche Rundschau*, Year 61, Part 21, pp. 705-721. Stuttgart, November 1, 1912.

In No. 2 of the *Archiv für exakte Wirtschaftswissenschaften*, 1912, the writer has published a paper upon the capitalization value of real estate based on the gross returns from the gross farming operations. The capitalization value can be better ascertained by the gross returns, and the expenditure and the value of the land. The net value thus obtained was rejected. A few weeks later appeared the *Landgütern und Grundbesitz* by Dr. Ernst, which considers the capitalization value of real estate based on net profits. The writer considers the capitalization value of real estate based on net profits.

1) See No. 1337, B, September 1912.

talization value as an important factor, Aereboe repudiates it entirely. In this work, the writer thoroughly investigates the radical demand of Aereboe, which would entail a revision of the laws of valuation which based upon the capitalization value and which he considers retrogressive.

He thinks Dr Aereboe's definition that the capitalization value of an estate should be estimated from the net profits to be expected in the future to be too narrow a conception and distinguishes between past capitalization value, i. e. that which can be ascertained, and future capitalization value, which can only be estimated. The latter is the more important for the purposes of valuation; the former however is indisputably of the nature of capitalization value. That the estimation of the capitalization value depends on the net profits of the past is no argument against this method. The estimation of the market value, which is recommended by Aereboe as the only correct one, must also be based on the past, and it is easier to arrive at probable future net profits from the consideration of dependable past capitalization values, than to estimate future market values from the sale prices of the past.

Aereboe's second argument against capitalization value is that the basis for this is not obtained by the estimation made by one value, but only by taking the valuation of the generality. This objection does not touch the essence of capitalization valuation, but only its possible application, for the estimation is arrived at from the average capitalization value of similar estates. Aereboe finds an additional difficulty regarding capitalization value in the fact that opinions differ as to what should be considered as forming part of the net profit of an estate.

According to the writer, however, the difficulties in the estimation of the changes in the capital have little effect on the average capitalization values of several estates.

Aereboe believes that valuations made on the basis of market value would include fancy prices which exceed the agricultural value of the property and considers that, for this reason, the above method is preferable to estimation by capitalization value. This, however, the writer believes to be rather a disadvantage, for the relation between the average capitalization price and the mean market value gives a measure of how far the sum exceeds the local customary prices of land.

Aereboe objects to the capitalization value, that equal incomes under the same conditions may have very fluctuating values, depending upon the amount of pleasure and comfort which the owner derives from the property, which is subject to great variations according to the tastes of the owner. An estate is, in the first place, a man's home, and the value of the estate is, in the first place, the profit. This objection is not valid, for the value, which tells us of the wants of the owner, is not a part of the value of the estate, but a part of the value of the property. In addition to the agricultural value, the value of the property is also determined by the convenience of the owner to a town, he is doing this, and for this reason it is again necessary to have recourse to the capitalization value.

ereboe then draws attention to the rate of interest, and says that returns with equal indebtedness of capital have to pay very different interest annuities and that the income of the agriculturist consists of the difference between his returns and the interest he has to pay debts. This faulty manner of estimating the value of property is, according to the writer, no reason why the science and teaching of valuation give up a correct method. Interest on debts and annual payments, of necessity, be included in the capitalization value, and this does with the objection that the rate of interest in a country varies according to time and place.

ereboe also considers that the conditions of taxation are a ground affecting capitalization value, for the value of the property depends on rate of taxes.

ereboe also alleges against the adoption of capitalization valuation the latter does not cover the price of the estates. This is true, but the capitalization value of a property is ascertained, it affords the means of calculating the risk he runs, in accepting the market of paying the property more than it is worth, and at the same time him to know how much more he pays it. On the contrary anyone who takes as basis only the average market price is no wiser than would-be buyers and has not a really clear idea of what he is doing. ereboe looks upon the price of an estate as the result of a long building of the market value and a criterion of the capitalization value of the property. According to the writer, however, he over-estimates the direction and foresight of the intending purchaser, for the present times show the small part played by capitalization valuation and the element of speculation in land purchase. The purchaser who does take the capitalization value as a basis will always value the land high, and if the land were to cost all farmers such high prices as correspond to the average sale prices of every decade, farming would almost to exist. The market values must be supplemented by estimates considering the land exclusively from the standpoint of its returns. According to the writer, the capitalization valuation affords the best safeguard against excessive prices being paid for estates; the recognition of market value as a basis for judging the conditions of the returns of an estate and the rejection of capitalization valuation is a step which can easily prove fatal to the agriculturist. ereboe says that the intending purchaser learns the sum demanded for the property, and the capitalization value affords him the means of knowing what he can expect. ereboe also says that the valuation of market value is given by the security is given by the estate, within not those parts of the property that are those parts of the property that are The writer does not see why the as good a basis of estimation as the Swiss Civil

law has defined the following limits for mortgages for which the Cantons are responsible, since they provide the valuations: A mortgage can amount to two-thirds of the capitalization value of the land and to one-half of the value of the buildings. The security of these mortgages is so large that the Cantons have not hesitated to make themselves wholly responsible for the valuation, in order that it may be made with all possible care. The writer does not consider that Aereboe's method of valuing the security is in any way an improvement upon the Swiss enactment.

Aereboe rejects the estimation of the capitalization value even in the case of the succession duty and maintains that this should be based on market value. He admits, however, that the market values of properties in a whole district usually exceed the capitalization value of the estates and sees the necessity of reducing them.

The writer readily agrees that the expropriation valuation must be based on the market value of the properties. Only in the rare cases where the capitalization value exceeds the market value can the owner be satisfied in demanding a sum of indemnity based on returns.

Neither the theory nor the practice of agriculture, nor legislation in any way be induced by the objections of Aereboe against the estimation by capitalization value to give up the important postulate that the land yields a capital yielding profit and that its capitalization value plays the part in its valuation, mortgaging, sale, inheritance and taxation.

The objections which Aereboe makes against the form of the so-called Ertragstaxe (calculation of net income) are so far admitted by the writer that he allows that the net income can only be ascertained by a system of book-keeping calculating separately gross returns and expenses cannot be ascertained from only one of these items. While Aereboe abandons the capitalization valuation also on practical grounds, the writer sees the possibility of giving the valuer accurately calculated average capitalization values by means of the formation of agricultural book-keeping offices. In the work mentioned at the beginning, the writer has shown how the material collected by the Swiss Peasants' Secretariat on the profitableness of farming can be made use of in estimating the capitalization values.

With the help of such returns, the Swiss Peasants' Secretariat has in the course of the last few years determined average capitalization values and the factors influencing them under the various conditions obtaining in the country. The writer, Aereboe's suggestion does not seem to him to be a very good one for the establishment of special valuation bureaus, since the work of collecting the necessary data for these valuation bureaus should also be done by the agricultural book-keeping offices which have already been done already for several years in the course of last summer. The Swiss Peasants' Secretariat has been commissioned to forward suggestions respecting an improvement of the laws for the valuation of property. It is a question also of the improvement of a Swiss Peasant's Association which should be able to extend the advantages of the new legislation also to the small farmers. The laws of inheritance and of the mortgage of property

Farming Problems according to Working Expenses and Difference of Net Returns.

STERMAYER, ADOLF. Landwirtschaftliche Betriebsfragen im Lichte von Produktionskosten und Reinertragsdifferenz. — *Archiv für exakte Wirtschaftsforschung*, Vol. IV, art IV, pp. 608-636. Jena, 1912.

The author endeavours to show by means of some examples the value the calculation of the cost of production has in judging some problems arising. In valuing agricultural produce he applies the simplest principles of practical experience. Thus, for instance, the money value of farm-manure is calculated according to a farm price which varies with the fertility of the manure and the soil of the farm; and for the sake of simplicity matters it is debited in equal proportion to all the crops of a rotation, the labour of the hands and teams employed in the operation of manuring is debited to the crop which receives the manure.

Next follows the average cost of production of a series of crops, calculated on the account books kept during the year 1910 in nine peasants' farms in Moravia. In the cost of production the interest at 4 per cent. of the capital invested in the farms is included as well as the wages for manual labour of the owner, but no indemnity for the direction of the farm.

The difference between the cost of production and the effectively realised prices does not represent the net returns, but the so-called difference of net returns (Reinertragsdifferenz), that is, the difference between the effective returns and the minimum interest required on the capital invested.

The writer shows that the cost of production varies inversely with the net returns and that consequently it depends in the highest degree upon many risks with which farming has to reckon. If the figures, which are taken from farms which have remained exempt from all injurious influences, be compared with the average costs of production, the differences clearly the characteristics of the year.

In the practice of illustrating the farm by means of book-keeping, the values drawn from the averages of several years are used, while the results of one year's accounts are useful in enabling comparisons to be made between them and their causes.

The data in figures given by the writer prove that the cost of production of winter cereals is throughout higher than that of spring wheat. Sugar-beet and mangolds show no important differences. The high cost of production of potatoes seldom occurs. The cost of production of hay is high, but paying one, the cost of production of h. is low. Rye and oats cost less in the conditions of the plains. The depth of soil in the while the greater rainfall is a disadvantage. The calculation of the difference that the farmer must take into account is possible to the actual conditions of production.

The employment of artificials reduces the cost of production of crops and the systematic working of meadows reduces the cost of produce by increasing the output.

The annuities for interest and amortisation of plain farms, on account of their greater value, are higher than those of mountain farms, which require greater quantities of seeds, of team work, of farmyard manure and of artificials.

The writer then proceeds to examine the question from the point of view of the profitableness of the farms.

The item of labour, on account of its importance, being one of those which weigh heaviest on a farm, has the greatest influence on its profits. The average daily wages at 1s. 4½d. (exclusive of board), normal amortisation and 4 per cent. interest on the whole capital, only sugar-beets in the plain farms and forage crops in both plain and mountain farms yield a profit higher than the interest. The profit on beets is the one that most feels the oscillations in the wages of labour; potatoes follow, then wheat and last all forage crops. Only the latter afford sure profit even with considerably rising wages and in the mountains continue to do so longer than in the plains. The present costs of production indicate clearly to farms in the mountains the profitableness of forage crops and live stock raising, and that, with an increase of wages, the intensity of farming can only be maintained on the most naturally favourable soils and by replacing the greatest expenditure of manual labour by machines.

The oscillations in the prices of farm produce have also a very great influence on the net returns, consequently on the profitableness of farms. The sensibility of a farm to the rise and fall of the prices of produce can be judged by the range of its net income.

In a general average for all the farms examined, the greatest sensibility exists in connection with the prices of live stock, then follow the prices of cereals and thirdly the prices of milk. Among the prices of cereals, variations in those of barley are most felt; they are followed by those of wheat and rye, and last of all by those of oats. Among live stock, the prices of oxen exert the greatest influence on the net profits of the Moravian peasants' farms; next come the prices of calves and of pigs. Here also a difference must be made between plain and mountain farms, inasmuch as the latter are more interested in the prices of live stock than of cereals, while the net profits of the former are more dependent upon the prices of cereals. In general, the profits of plain farms are much more dependent upon the prices of live stock than the profits of the mountains. The prices of produce than the

A comparison of the changes in prices on the net returns of farms in Belgium and in the Netherlands shows that the changes of wheat affect large farms more than small ones, and that the changes in the prices of live stock. Both in Belgium and in the Netherlands, however, per unit of surface, the same changes in the prices of wheat and of live stock and consequently the same changes in the net returns and commercial policy which ensure such profits.

Book-keeping thus points out to the farmer the lines on which to size his work, and at the same time it renders incalculable services to cultural policy and economics.

The Work of the Office of Farm Management, of the United States Department of Agriculture.

HILLMANN, W. J.: U. S. Department of Agriculture, Bureau of Plant Industry, Bulletin no. 259, 84 pp. Washington, October 1912.

In Part I of this Bulletin the attempt has been made to present an outline of the science of farm management, in so far as the knowledge of the principles of this science is available, and to point out the principal deficiencies in this knowledge. The object of Part II of the Bulletin is to present an outline of the organization and work of the Office of Farm Management, with sufficient discussion to make clear the methods of investigation used and the purposes to be attained.

The work of the Office of Farm Management is divided into five sections as follows:

- (I) *Office administration and records.*
- (II) *Farm economics.*
- (III) *Special farm-management studies.*
- (IV) *Farm management field studies and demonstrations.*
- (V) *Utilization of cacti and dry-land plants.*

(I) The first section is responsible for the care of the library and the such as correspondence and field reports of the staff; for the preparation and care of photographic records; for the revision of manuscripts; or the financial records of the office.

(II) The subdivision of the work in the Section of Farm Economics is based partly on methods of investigation and partly on subject matter. Various types of investigation in progress are agricultural cost account-keeping, farm management surveys, farm equipment, marketing farm products, agricultural credit, agricultural insurance and history of farm management. Several methods, differing more or less, are used in cost accounting in the Office of Farm Management.

One of these is as follows: Detailed records of all labor performed and transactions occurring on a considerable number of farms, are received in the office, and tabulated in such manner that the cost and the value of each enterprise on the farm, and the farm expenses can not be charged to any one enterprise. This renders it possible, at the end of the year, to determine the net gain or loss from each enterprise, as well as of the farm. In this work the office of the Agricultural Experiment Station, University of Missouri, the records are tabulated at the institution, and transmitted to Washington. The records are received and tabulated in the Office of Farm Management.

Another method differs from the foregoing in the fact that the furnishing the records are located in a selected locality and are visited at frequent intervals by a representative of the office; these groups of farms are known as cost-accounting circuits. A representative of the office devotes his whole time to the 15 to 20 farms constituting one of these circuits.

In co-operation with the New York State College of Agriculture at Cornell University, the office employs a man who devotes his time to visiting a number of farmers, in the State of New York, to develop systematic bookkeeping including cost-accounting records.

The Office of Farm Management also furnishes to several hundred farmers, well distributed over the country, a special form of diary, and suggestions and recommendations are made to the farmer, as to the records and suggestions it is worth while to keep. Experience with these diaries has shown that they give much valuable data concerning the cost and income of farm enterprises, and the dates when various farm operations occur. This latter information is of special value in studying the important question of the seasonal distribution of labor on the farm.

Besides the cost-accounting investigations just described, which cover the whole farm, others are conducted on single enterprises with representatives visiting a large number of farms on which the enterprise under investigation is conducted.

The following is a partial list of the subjects on which the records obtained in the cost-accounting work furnish data of more or less value:

Kind, number and dates of operations required by every enterprise.

The character of crew (men, horses and machinery), and the amount of work and total time required for each operation.

The proportion of days in a given period that are available on the average for field work, or, the proportion of time lost from rain, holidays, necessary trips to town, unavoidable delays and the like.

Cost of production and income from the various farm crops and types of live stock, under a wide range of conditions.

The general farm expenses, or the "overhead charges" on the productive enterprises of the farm.

The returns per hour of labor spent on different enterprises.

The amount of use, and hence the cost per acre and per unit of product, of each piece of equipment, and its replacement, determined both from the successive annual inventories and from the depreciation account. The amount of work it does and the length of its useful life.

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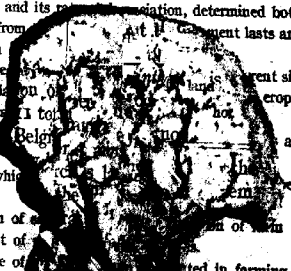
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distribution of capital between the various factors of production, such as land, buildings, work stock, productive stock, implements and machinery, etc.

of housing and feeding farm animals.

of horse labor.

of man labor.

of records adapted for use by the farmer.

These investigations cover practically the whole field of farm management but many of the above data can be secured by cheaper methods. Another important line of investigation conducted by the Section of Economics is the farm management surveys. In this work localities are selected that are believed to be representative of important agricultural regions, and studies are made on every one of 500 or 600 contiguous farms, no being omitted from which it is possible to obtain the necessary data. These surveys are intended to reveal the actual status of the agriculture of the regions in which they are made.

Sufficient data are obtained from each farm to enable the investigator to determine the amount of capital invested, the value of all the major items of equipment, the amount and character of the farm expenses and receipts, the increase or decrease in the farm inventory for the past year, and other facts necessary to determine the labor income of the farmer, including interest on the investment, and wages for the unpaid labor by members of the farmer's family other than the farmer himself. The data obtained also permit the study of such questions as the relation of profits in farming to the education of the farmer, the relation of the farmer to the percentage of tenant farming, the effect of distance from markets on the value of farm land, and numerous other questions of importance to agriculture in general.

The methods used in the investigation of equipment problems are closely related to those used in the farm management surveys, though they are more detailed than the latter; the data are in the main obtained by personal visits to the farms studied, careful inventories of the various items of equipment being made. The study of actual practice, on a large number of successful farms, is thus the best means of arriving at the solution of many of the problems relating to farm equipment. The following is a brief outline of the important subjects under investigation in the study of farm equipment.

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Farm fences: Conditions requiring or justifying fences; relation of the layout of the farm to economy in fencing; the cost of fences of different types; the amount of labor required in constructing fences; the cost of keeping them in repair; and their rate of depreciation.

Water supply and sewage disposal on the farm: Types of equipment and cost and practicability of the same.

Systems of heating and lighting farm buildings and the cost of installing and operating the same.

Equipment of farms of a particular type.

Relation of the size of the farm to the character, especially the size, of the equipment.

Equipment for particular enterprises.

General farm equipment and minor items of equipment.

Equipment for particular operations: this includes a study of the wide variation in practice in performing the same work and of the causes underlying this variation; the cost of a given operation when performed with different equipment.

Duty of machinery: namely the amount of work a machine or implement does, or should do, in a given time.

Standards of farm labor: A study of the amount of labor that may fairly be expected of a farm laborer under all conditions and in all kinds of farm work. Data of this kind are of enormous value in the management of hired labor, as well as in planning in advance a season's work, or in making out a working plan for a farm.

The proportion of time available at different seasons of the year for work of different kinds, especially for field work. The amount of labor and the number of work animals needed on a given farm at different seasons of the year.

Equipment charges: The rate of depreciation of farm equipment of all kinds; the cost of repairs; the cost of housing implements and machinery; the rate of interest on money invested in equipment of different kinds; and the amount of annual use of equipment as bearing on the equipment cost of farm operations.

The conditions, especially the amount of use, that justify the purchase of a given item of equipment. Conditions which make hiring more desirable than the purchase of equipment.

Advantages and disadvantages of joint ownership of the more expensive machines and implements.

Use of mechanical power instead of horse power on the farm: Attention is given to the types and sizes of tractors in use; conditions to which the various types are best adapted; conditions which justify the purchase of a tractor, also its original cost, the cost of repairs, and rate of depreciation; the cost of operation and the crews and supplies required; the amount of work done per day and per season; and the cost per unit of work done.

Ancient and medieval literature regarding farm management, while by no means extensive, is yet sufficient to enable the careful student to gain a fair idea of the conditions in agriculture at most stages in the history of Europe. A study of this old literature is better made in order to get such of it as will interest farmers.

A study of the different parts of the country, especially those that go to the ultimate consumption of the farm, with special reference to the prices received; methods used in transporting perishable products, to distant markets, and methods to market values; methods of organizing cooperative marketing associations; the effect these associations have on the net returns received by the farmer.

distribution of enterprises with relation to the market centres ; and finally the difference between prices received by the farmer and those paid by the consumer and the reasons for this difference.

An investigation is made of the sources of available credit for the farmer, the conditions under which he may obtain it for financing his operations, the rates of interest on farm loans.

A study is also made of farmers' mutual insurance societies, their organization and conduct, and the rates of insurance paid.

The three subjects just enumerated belong to rural economics rather than to farm management, but are investigated in the Farm Management Section on account of their intimate relation to the subject of farm management, as well as for administrative reasons.

(III) This Section devoted to special farm management studies has given special attention to the problem of tenant farming, which is not only important at the present time, but is likely to become more so in the future. It can hardly be doubted that tenant farming will further increase in the United States, and that ultimately the land will largely be owned by wealthier classes, and be farmed by tenants with moderate capital. Two phases of the subject are receiving special attention : one of these relates to the amount of working capital required to conduct a farm properly, especially with a view to maintaining the fertility of the soil, and the ability of inducing the landlord to furnish this capital where the tenant is unable to do so. The other relates to the details of the contract between landlord and tenant.

Another problem under investigation is the relation existing between the distribution of different types of farming enterprises and the geographical factors, so as to ascertain what are the real limiting factors in the distribution of the enterprises.

The study of the problems of clearing and utilizing logged-off land, although not strictly a subject for farm management investigations, has been taken up by the Office of Farm Management, which is investigating the methods in use in the various sections of the country where these lands are being put into cultivation, as well as studying problems connected with the improvement of these methods.

The Office of Farm Management is also engaged in gathering up careful records of the effect of definite systems of farm management on the fertility of the soil, especially those that give satisfactory results. Being made of the leading farm crops of the country, the results of the investigation will be of great value in determining the economic conditions which render their cultivation profitable. Farm practice in weed control is also investigated in this Office, and particular attention is given to the relation of weeds to the various types of farming in different sections of the country.

The farm management features of the investigation also extend to the amount of labor required, to the cost of production, and to the best manner of utilizing the crop as a source of revenue. The results of the investigation are also studied.

Special attention is being paid to the cropping systems used on successful stock farms in all sections of the country and also to the maintenance of pastures and their place in the economy of the farm.

(IV) In the administration of the work of the Section of Farm Management Field Studies and Demonstrations the country is grouped into three divisions as follows: The North Atlantic and North-Central States, the South Atlantic and South-Central States, and the Western States. In the cotton-producing States the demonstration work is conducted by the Farmer's Co-operative Demonstration Work. A division leader has charge of the work in each of the foregoing groups of States. Each of the geographic divisions mentioned is subdivided into groups of a few States each, and the division leader has an assistant or district leader in each of these groups. They devote their time mainly to the investigation of farm practice, but assist in the supervision of demonstration work. In the cotton States their whole time is devoted to investigations.

The objects to be accomplished by the work of the Section of Farm Management Field Studies and Demonstrations of the Office of Farm Management may be briefly stated as follows: 1) To carry to the farmer the results of scientific research on his behalf, as well as the results of the experience of other farmers, and to aid the farmer in applying these results to his work.

2) To reorganize and redirect the agriculture of the various sections of the country in such a way as to secure, on each farm, not only enterprises that are profitable in themselves, each being so conducted as to bring maximum net returns, but also to secure a system of enterprises that will permit the largest economical use of power, capital and labor possible under the conditions, and which will give, as nearly as possible, an even distribution of labor and a full utilization of equipment throughout the year.

(V) When the Office of Farm Management was organized and the work with grasses and forage plants transferred elsewhere, the work with the cacti and dry-land plants was retained, because of the personal interest of representatives of this office in certain important problems relating to these, and it has since been maintained in the Office of Farm Management. The first investigations of the cactus, as an economic plant, represented a study of farm and range practice in the use of these plants as forage for cattle. Much time was spent in working out the cultural details of the cactus, when it was first introduced into the country, and several feeding experiments have been conducted to determine its value.

The range of cacti and dry-land plants on which this office are designed to secure accurate information on the following subjects:

- The possible uses of cacti and dry-land plants, under partial and complete irrigation, and the rate of growth.
- The possibility of growing cacti and dry-land plants artificially.
- The carrying capacity of cacti and dry-land plants, normal and possible.
- An estimate of the economic distribution of the open range, with a summary of published topographic data relating thereto.

Range management with different kinds of stock with and without fence.

The hay-cutting operations and the collecting and weighing of the feed are beginning to furnish accurate data on the actual amount of feed per acre produced annually on the protected range. These data, when compared with those obtained from the records of stock actually carried on adjoining unprotected areas will give something definite as to the normal carrying capacity of this region.

The data are obtained from experienced stockmen in different parts of the country working under different range, climatic, and commercial conditions.

BRINKMANN, TH. Veränderungen in der Betriebsweise der rheinischen Landwirtschaft und ihre Ursachen.— *Fühlings Landwirtschaftliche Zeitung*, Year 61, Part 19, pp. 625-643. Stuttgart, October 1, 1912.

As for the changes in the farm labor market, according to a recent publication by the U. S. Department of Agriculture, the wages of farm laborers have increased on an average by 100 per cent. in the last 10 years. The increase has been still higher. On the other hand, the prices of many of the farm products and implements have seen a sharp decline. The result is that the farmer has a harder time of it than he used to have. The government is now trying to help him out by giving him a loan to help him out.

Artificial manures, namely those which have become much cheaper since 1914, are: (a) If it isoric acid or nitro-

table :

Period	1 lb. Phosphoric acid in superphosphate	1 lb. Nitrogen in nitrate of soda	1 cwt. of manure containing 12.4 % of pure potash
1880-89	3.23 ^d	9.60 ^d	10.75 ^d
1909	1.87 ^d	6.15 ^d	8.96 ^d

The oscillations in the prices of concentrated foods are less uniform, some being cheaper and others dearer.

The prices of the means of production form one factor in the conditions of production, and the prices of agricultural produce the other. In connection the writer gives the decade averages of the prices of the most important agricultural staples in Prussia proper, reaching back for nearly a century. The earliest part of this period, which is characterised by continuous rise in prices, is here omitted, and in the following table only prices of the last decade are shown, considering the prices of the period 1871 to 1880 equal to 100.

	Wheat	Rye	Oats	Straw	Hay	Potatoes	Beef	Veal	Pork	Prussian Smoked Bacon	Prussian Lard
1901-10 . .	86	95	104	105	97	100	132	166	123	92	96
1911 . . .	89	95	111	109	106	161	146	187	119	92	96

In the next table the prices for the Rhine province are given; the figures from 1901 to 1905 = 100.

	Wheat	Rye	Oats	Barley	Straw	Hay	Potatoes	Beef	Pork	Veal
1906-10 . . .	100	100	100	100	103	101	112	114	111	116

The writer has also given a table showing the consumption of artificial fertilizers, which is steadily increasing, in the various provinces of farming.

The following table shows the consumption of pure potash (K_2O) in lb. per acre, which affords an idea of the increase in consumption.

	1900	1910
0.27	1.58	6.88
0.84	3.70	11.02

A further change in farming is brought about by the extraordinary rise in the price of labour and the consequent necessity of using labouring machines. In an extensive table the writer shows what changes taken place during the last thirty years in farming in the Rhineland. It appears thus that machines are not only used in the large farms but also in the smallest, for in 1907 an average of 35 per cent. of the farms measuring 5 to 12½ acres in extent, and nearly 6 per cent. of the smallest farms used large machines.

Changes on a large scale in the utilisation of the soil can only be perceived by examining a considerable period of time. The writer therefore collects data, for the period between 1878 and 1900, on the crops raised, grouped according to their destination. They are divided into five groups, the percentage of the whole cultivated area that each occupies is given. The most striking changes in the areas devoted to the various crops are the following: The groups of purely forage plants and of those with a twofold destination have both gained ground, while since 1893 the area devoted to wheat has considerably diminished in all the districts. Similarly spring wheat and barley have lost ground, barley losing almost a quarter of its original area. Oats have sustained their price best of all. Oat straw has increased in importance as fodder, which is explained by the greater use of concentrated feeds together with straw, and especially oat straw, in the feeding of stock.

Very interesting also are the results of a table, drawn up by the writer, which shows how the extent of live stock rearing has changed during the last twenty years in the various classes of farms, grouped according to acreage. It proves, in accordance with what may be daily observed, that the amount of cattle kept by the smallest farms has everywhere diminished. On the other hand, they show that the small peasant farmers present already the tendency to increase in their stock of cattle and that with the increased acreage of the farm both the amount of cattle and its increase from 1883 to 1907 has less and less. Similarly in pig keeping, only that here the difference exists in the fact that the smallest farms take the lead considerably ahead of the others, especially in the thickly populated Düsseldorf district.

The last thirty years have witnessed an extraordinary increase in the quantity of live stock kept, but it must be recognized that this increase has not been equally distributed; in fact, in its most important branch, namely cattle, the maximum has been passed, for the last few years the movement has been in the opposite direction, nearly the same in all districts. Though it is a fact that the number of cattle has somewhat diminished during the last few years, the increase in the production of animal products will be favourable. The difference in the consumption of live stock between the city and country, between large and small farms, between the several classes of the population according to their means of subsistence, leads to the conviction that if there is a branch of agriculture which offers out prospects of greater profits, it is the keeping of live stock for the production of meat and milk.

59 - The Remedies for Rural Depopulation in Great Britain.

STROUT, HON. EDWARD GERALD, President of the Surveyors' Institute. Op Address read at the ordinary General Meeting of the Surveyors' Institute, on vember 11th, 1912. — *Transactions of the Surveyors' Institute, Session 1912-1913, Vol. I, Part I, pp. 1-42.* London, November 11th, 1912.

• One of the great questions now agitating the people of Great Br is the decline of the agricultural population.

The following figures showing the people engaged in agriculture in land and Wales between 1881 and 1901 will illustrate the importance this subject.

Date	Farmers and Graziers	Agricultural Labourers including Shepherds and Carters	Totals
1851	249 431	1 376 051	1 625 482
1861	249 735	1 296 805	1 546 540
1871	249 907	1 073 084	1 322 991
1881	223 943	965 217	1 189 160
1891	223 610	866 034	1 089 644
1901	224 299	727 140	951 439

One of the most unsatisfactory features of the agricultural statis is the continually increasing area of pasture land and the decrease in ara The loss of 2 000 000 acres of arable land in Great Britain in the two years 1881-1901 probably threw out of work from 60 000 to 80 000 labour at least during that period. The number of acres withdrawn from plough since 1901 is about 942 000, making a decrease in arable land in the years of nearly 3 000 000 acres. It would therefore appear that one of most effective ways of increasing the agricultural population would be to reconvert a considerable portion of these inferior pasture lands to th original use, which is that for which they are best fitted.

During the last fifteen years, on an estate in which the writer is terested in the field accounts have been kept of the results of the expenses and of the results of the land, and certainly st striking results are shown. The fashionable theory of wit on agriculture is that the farmer is no longer able, and that the farmer n now look entirely to the State for his success in his venture.

These accounts show that on an estate of roughly 2 000 acres, of wh about three-fifths is pasture, the results are as follows:

Table I summarizes the results per acre over 1) the wh eighteen years; 2) the last six years and 3) the last six years. The average profit per acre has been arrived at after charging all expenses including rent, but excluding interest on capital.

	Total number Acres	Average Profit per Acre			Total number Acres	Average Profit per Acre			Total number Acres	Average Profit per Acre		
		£	s.	d.		£	s.	d.		£	s.	d.
Wheat	4 003	2	18	8	2 358 ½	2	5	2	1 704 ½	3	17	0
Barley	3 603 ½	2	3	4	2 480	2	1	4	1 123 ½	2	7	9
Winter Oats	1 980 ½	2	18	6	1 238 ½	2	17	6	742	3	0	1
Spring Oats	1 337 ½	2	1	7	740 ½	1	19	2	617	2	4	8
Beans	521	1	5	1	354	1	1	11	167	1	11	11
Peas	595 ½	0	19	11	389 ½	—	0	3	206	3	3	8
Swede and Turnips	546	2	5	5	485 ½	2	8	9	60 ½	0	18	6
Red Clover	2 084 ½	2	11	6	1 288	2	9	9	796 ½	2	14	4
Lucerne	785	1	9	6	695 ½	1	8	9	89 ½	1	14	8
Grass	726 ½	1	5	4	544 ½	1	6	7	182	1	1	3
Maize	526	0	6	3	337	0	7	9	189	0	3	7
Permanent Grassland	13 514 ½	0	18	2	1 668 ½	0	10	0	988	1	12	5
Age, 1860-1870	2 656 ½	4	13	1	113 ½	—	0	12	402	6	2	9
Age, 1870-1880	515 ½	—	0	2	505 ½	—	0	4	197 ½	0	0	2
Age, 1880-1890	703	1	4	10	236 ½	1	4	0	38 ½	1	6	6
Age, 1890-1900	275	0	7	11	9 133 ½	0	8	7	4 381	0	6	6

Note: Losses are shown by — (minus).

As far as the problem of increasing the number of small holders is concerned, the writer is of the opinion that any attempt to augment the number of all-holding tenancies should be carried out under a definite and carefully thought-out scheme, the small holders being placed in positions where they could conduct successfully the special industries with which the small holder has an advantage over his larger neighbour. The districts selected should be those with market facilities, where small holders already exist, where the soil, climatic and transit conditions are favourable for the growth of special crops requiring the interested and careful attention of the cultivator. The growth of intensive crops would also assist in maintaining a larger agricultural population, and in this connection the following showing the acreage under small fruit, apart from orchards, in 1900 and 1911 is noticeable, the percentage of increase being large:

Year	England	Wales	Scotland	Total
1900	66 749	1109	5922	73 780
1911	76 287	902	7119	84 308

To turn to another intensive crop, the acreage of hops in England in 1911 was 33 056 acres, the total ten years previously being 51 127 acres (61.45 in 1891). It will be observed that there was a large reduction in the ten years 1901 to 1911. The cost of cultivation is so large that it can be grown only by capitalists who can stand the variations of good and bad seasons and who are prepared to take every advantage of the latest scientific knowledge. It is nevertheless an industry which directly employs a great deal of labour, costing, it is estimated, at least £18 per acre, if it could profitably be extended where the land is suitable, it would do a large amount of additional work for the agricultural population. Another crop requiring a large amount of labour, and about which a good deal has been said during the last few years, is sugar beet. The importance of the introduction of the growth of sugar beet in England cannot be overestimated, for if a good alternative crop could be grown which would pay a fair price, and at the same time clean the land, it would remove many of the agricultural difficulties now existing. All possible support and encouragement should be given to pioneers of this industry, realising that if they succeed in their undertaking they will have rendered a great service to British agriculture.

There are many other ways in which the Government might improve the prosperity of agriculture, and thus the population on the land. The practical instruction of the small holder seems of primary importance; provision should be made for the transport of cheap transport lorries in connection with the centres of production.

An extension of forestry is also proposed as a means of increasing the country population, but it is difficult to see how it can be carried out on a large scale.

of fair value could be made a commercial success, though possibly as a result of compulsory saving to individual landowners it might have advantages.

And lastly, though certainly not occupying that position in importance there is the question of rural housing. In this respect it might be advisable to follow the example of Ireland under the Labourers Acts. The district councils formulate schemes for the erection of houses and curing garden plots in accordance with the requirements of their districts, the Local Government Board being the department responsible for holding local inquiry into any schemes put forward and for sanctioning them, satisfied that they are reasonable.

If a scheme is sanctioned, the necessary capital is advanced by the Local Commission repayable in $68\frac{1}{2}$ years by equal payments. The interest is 3.5 per cent — $2\frac{3}{4}$ per cent. representing interest and $\frac{1}{2}$ per cent. sinking fund. The number of houses authorised to the 31st March 1910 was roughly 49 000, of which 40 000 have been built and occupied, and 9 000 are in process of erection. Parliament voted £5 250 000 altogether in connection with these Acts, and it has been earmarked for housing purposes.

Whatever may be done, either in the directions indicated by the writer or in others, it is essential, if the rural population is to be increased, that the cultivation of the soil should be a paying business. The English cultivator has to compete with all parts of the world, and no undue burden there should be placed on his industry.

A wise Government should give him every assistance possible, particular care being taken to encourage the expenditure of capital on the land, and so far as possible to assure to all those engaged in the industry a reasonable reward for their enterprise.

The writer closes his address with some considerations concerning the breaking up of large estates, which is the noticeable feature of the present day and expresses the opinion that the same has probably two main causes: the chief one, the Finance Act of 1910, and the increase of duties, which press with peculiar severity on agricultural estates, together with the promise of further legislation which may be antagonistic to the landowning class.

AGRICULTURAL INDUSTRIES.

60—The Importance of Milk in the Catarrh of the Vagina in the Control of Milk.

MESSNER, ANDERSON, and others. Über die Bedeutung des infektiösen Scheidenkatarrhs für die Milchhygiene, Year XXIII, Part 5, pp. 39.

Not only the mammary glands themselves bring about great changes in the secretions, but these alterations are also induced by the diseases usually associated with high fever which attack milch cows.

In epidemic diseases, milk control entails, not only taking measures to protect the cows and animals from infection, but as

whether the normal physical and chemical composition of the milk differed in any way, for only by such means can it be determined whether perhaps some of these changes are due to want of cleanliness in milking of the milk.

The writers have examined to this end the milk of cows suffering from infectious catarrh of the vagina. To ensure accuracy in the comparison, the milk of the healthy cows inhabiting the infected shed was also used.

The tests were usually made midday and evening, and the following were noted.

1. The breed or family of the milch cow.
2. The age of the animal.
3. Duration of lactation period.
4. Milk yield.
5. Condition of health.

The following data were obtained from the examination.

1. The specific gravity, by means of lacto-densimeters.
 2. The fat content (using Gerber's sulphuric acid method).
 3. The dry matter, reckoned according to Fleischmann's formula.
 4. Solids not fat.
 5. The refractive index of the milk serum (Ackermann's method).
- The milk of 105 cows in 29 sheds was investigated, and 40 of these were healthy, 65 diseased; 56 were attacked by chronic catarrh of the vagina, but only 9 had the disease in the acute form. The appearance of the milk is unchanged and it is only on examining the samples that the difference is clearly seen. The milk yield decreases, the fat content rises, the amount of solids not fat diminishes and the refractive index is lower; but all these changes are only distinctly noticeable when the milk of diseased and healthy cows is compared at the same time of the lactation period.

For this purpose, the writers compared the averages obtained from the examination of the milk from 8 healthy cows and from 9 animals suffering from the acute form of the disease:

	Healthy	Diseased	Difference
Total milk yield	2.53	1.80	- 0.73
Specific gravity	1.0330	1.0332	+ 0.0002
Fat content . .	3.5	4.1	+ 0.6
Solids not fat .	9.21	8.1	- 1.1
Refractive index	1.402	1.398	- 0.004

The deficiency in the milk yield of diseased animals was 28.8 per cent., in the case of chronic catarrh of the vagina about 13 per cent. The difference is sufficient to be of economic importance. The following is a summary of the results obtained from the examination of the milk of cows suffering from infectious catarrh of the vagina. The milk of diseased cows contains on an average a decrease in specific gravity of 0.0002, the fat content is 0.6 per cent. higher, the amount of solids not fat is 1.1 per cent. lower, and the refractive index is 0.004 lower.

content and a lower refractive index, but on the other hand, the content is increased.

2. Thus this milk would be passed as excellent in quality, the data obtained by its examination were compared with those referred to the product of healthy cows.

3. It appears, from the data obtained, that a change in the method hitherto adopted for milk control is not necessary if all the characters of milk are considered together.

61. A Quick Method of detecting Water in Buttermilk.

HÖYBERG, H. M. Ein schnelles Verfahren zur Bestimmung des Zusatzes von Wasser in Buttermilch. — *Zeitschrift für Fleisch- und Milch-hygiene*, Year XXIII, B pp. 104-107. Berlin, December, 1912.

Hitherto, it has not been very easy to determine whether water has been added to buttermilk or not, especially when it was impossible to prove the presence of nitrate, the latter substance being absent from some waters; further, it may be introduced by the water used in washing.

Therefore in legal proceedings the only method at present employed for judging the purity of the buttermilk is the determination of the solids-not-fat content, for the fat content is too variable to be used for this purpose. The writer proves by his experiments that the solids-not-fat content of buttermilk often sinks below the usually accepted minimum amount without any addition of water, while it often remains the same even when water is added. Also, from the solids-not-fat content it is impossible to determine the quantity of water present.

Another more accurate method of determination must therefore be adopted. Such, for instance, as estimating the specific weight of buttermilk and whey.

As the thick consistency of the former prevents its specific weight being determined in the usual manner by an areometer, the weight is obtained from the whey contained in the buttermilk.

He heated $\frac{1}{2}$ litre of buttermilk to 50° C., pressed the butter through a piece of thick linen, and cooled it to 15° C. He then determined the specific weight in 112 experiments by means of an areometer and obtained the following data.

The whey of unadulterated buttermilk has a specific gravity of from 1.0250 to 1.0275.

If the specific gravity of the whey is below 1.0250, the buttermilk may be regarded as adulterated with water.

Further, the specific gravity of the whey is not affected by the amount of water added to the buttermilk. The specific gravity falls only slightly with the addition of water; thus this method affords a means of determining with some accuracy the amount of water which has been added. In this way, adulteration in buttermilk samples can be easily, and sufficiently accurately detected.

In conclusion, the writer remarks that it is necessary to distinguish between direct and indirect watering of the buttermilk; the latter is from steam being passed through, or if ice is added to the cream in order to cool it.

Further, water may be introduced if the milk utensils, *e. g.* the cooler apparatus, are not water-tight.

- A Study of the Gases of Emmental Cheese.

MARK, WILLIAM MANSFIELD: *U. S. Department of Agriculture, Bureau of Animal Industry. Bulletin 151. September 7, 1912.*

The writer aims at ascertaining by means of exhaustive experimentation the nature of the gases present in the so called "eyes" in Emmental cheese, and of those which cause the formation of these cavities. He is aided, by means of apparatus devised by himself, not only in collecting the gases in the eyes, but also those in the "pinholes". These he subjected to qualitative and quantitative analysis.

In normal eyes, the gases consisted of carbon dioxide and nitrogen, with traces of oxygen and hydrogen. Spectroscopical investigation also indicated that hydrogen can play no part in the eye formation, as no significant amount of hydrogen was found, and it was proved that this had not escaped detection from its rapid diffusion out of the body of the cheese. The production of hydrogen was however very active while the cheese was in press, and small percentages of this gas generally accompanied abnormal eyes. This is probably due to a slight initial fermentation of the sugar. It has, however, been shown, that traces of sugar have disappeared by the time of the formation of normal eyes, and further, that sugar fermentation and the formation of eyes have nothing to do with the production of these cavities. In the ripening process of the cheese, therefore, two types of gas formation may be distinguished. The one is highly detrimental and is accompanied by hydrogen, while the other is demanded in a good Emmental cheese. One is dependent upon the presence of sugar, the other occurs in the absence of sugar.

With regard to the oxygen, the writer found that a large amount of this gas was absorbed by the cheese, but only small traces of it were found in the cavities. Oxygen is also absorbed from the air which penetrates the cheese, but the nitrogen remains in the eyes.

Emmental cheese has a low permeability for air and for gases in general, especially when it is dry. Only a small amount of air can penetrate into the cheese, and since the amount of this small quantity of air is absorbed, it follows that the interior of the cheese is an environment eminently favourable for the growth of anaerobic bacteria.

The nitrogen which is found in the eyes is derived from the air which is absorbed by the cheese, but it is, as was proved by experiment, not retained by the

curd. It can, however, be considered certain that no free nitric acid arises in the formation of the eyes.

Only carbon dioxide plays an important part in the formation of these cavities and forms the greatest part of the mixture of gases contained in the latter. Von Freudenreich and Jensen considered that the formation of carbon-dioxide in the eyes was due to the activity of propionic bacteria, but the writer proved mathematically and practically that the action of these micro-organisms is not sufficient to account for the large amount of carbon dioxide which is formed during ripening of the cheeses, for the whole amount of the gases formed is not only occurs in the cavities but also saturates the body of the cheese. Further, a large increase in the formation of carbon dioxide takes place if the cheese is manipulated with sterilized instruments.

If the bacteria are indeed concerned in the production of carbon dioxide, the question still remains whether they are sufficiently multiplied to cause the eyes. The writer suggests that there are two planes in the formation of normal eyes, a saturation of the body with carbon dioxide, and an inflation of the eyes. He allows that the part played by anaerobic bacteria in gas production is an important one, but leaves it an open question whether their action in the formation of eyes is primary or secondary. The writer notes in this connection that a number of cheeses made with artificial rennet, which did not contain propionic acid bacteria, began a normal eye formation, but as this ripening seldom developed into normal holing, he asks if it is not possible that the reaction which started the eye formation was rendered incomplete because the gas-producing propionic bacteria, which might have saturated the cheese with carbon dioxide, were absent. He is, however, of opinion that exhaustive research and the qualitative and quantitative investigation of the gases at every phase of cheese-ripening alone solve the question.

63 - Insects Infesting Woollen Tops.

FROGGATT, WALTER W. — *The Agricultural Gazette of New South Wales*, Vol. XI, Parts 6 and 10, pp. 491-492 and 900 + 1 plate. Sydney, June and October, 1911.

In the first of these articles the writer ascribes the injury done to a large quantity of woollen tops, which had been shipped from New South Wales to Japan, to a cosmopolitan carnivorous species of the *Cleridae*, *Necrobia rufipes*, called the "Red-legged Ham Beetle" in England, because it feeds upon ham, and in the Islands it is known as the "Copra Bug", as it devours coconut kernels. This insect was first identified by the writer from specimens of infested tops sent to him by Mr. J. H. B. Fraser.

After the publication of the first account, several authorities among shipping people and others who had seen woollen tops destroyed, not by the "Copra Bug" but by a different insect, sent a second lot of samples of tops sent to Japan, the writer was able to identify the larvae different from those which had been present in the first lot; these proved to be the larvae of *Dermestes cadaveris* (the cosmopolitan Skin Weevil). This destruction

is plentiful in sheep-breeding centres and in hide and skin stores. *Cadaverinus* occurs most commonly in ships which trade in Australia and the Far East. It is not only necessary to treat the holds of such vessels as carry hides, skins and bones, but further the loose fittings should be examined and removed if infested with insects.

"Vin de Goutte" and "Vin de Marc".

18. L. Vin de Goutte et Vin de Marc. — *Annales des Falsifications*, 5th Year, No. 49, 509-527. Paris, November 1912.

The writer gives the name of "vin de goutte" to the wine, which is made by itself from the grapes, whether the latter are crushed or not, while "vin de marc" is that which remains in the solid particles of the pomace after draining and which is extracted, either by pressure before or after fermentation, or by diffusion after fermentation alone.

There is a great difference in composition between these two kinds of wine, made from the same vintage, and notably in the alcohol content, which might lead to the suspicion of adulteration. The method of wine-making used, the system, or the completeness of the crushing, the development of the mechanical apparatus attached to the crusher for separating the juice or removing the stalks, the submerged or the floating pomace, the time of fermentation, and the degree of the ripeness of the grapes, are factors in determining the differences, which are often great, between "vins de goutte" and "vins de marc" from the same vintage, i. e. between the "vins de goutte" and those which are, later on, pressure or diffusion wines according to the process employed for exhausting the pomace.

M. Bouffard has already obtained, by means of laboratory experiments, a difference of 0.6 between the average degrees of two pressures from the same vintage, of which part was thoroughly, and the other half crushed.

The writer has observed numerous cases where "vins de marc" resulting from the method of mixed wine-making, by which it is proposed to make wine from the same vintage and at the same time, white or rose-coloured wine, have an alcohol content 2 or 3 per cent lower than that of "vins de goutte". If the different parts of the grape are examined, it can be seen that the decrease in alcohol is due to the vegetation water in the fruit occurring in part of the grape only. According to M. Girard 1000 kg. of Aramon grapes furnish:

Grape stalks 10
Berries 90

The percentage composition of the berries is as follows:

Pulp 60
Skins 10
Pips 30



These figures, if applied to 959.3 kg. of grapes, give for 1000 kg. of complete vintage :

Stalks	40.70 kg.
Pulp	851.95 »
Skins	90.65 »
Pips	15.69 »

The 851.95 kg. (1874.29 lbs) of pulp, of a density above unity respond to 800 litres (176 gallons) of juice. Thus, if from such a pulp when crushed, on the first operation 500 litres (110 gals.) of juice is obtained, there still remain 300 (66 gals.) in contact with the solid part of the fruit forming the pomace of this first pressing. The composition of these portions is as follows, according to the same analysis of M. Lindet.

The percentage composition of the Aramon skins is considered :

Water	76.80
Other substances	23.20

It should be noticed that the other substances, summarized at the end of the table, do not include sugar. The percentage composition of the pips, which do not contain sugar, is :

Water	34.82
Other substances	65.18

That of the stalks, also without sugar, is :

Water	79.66
Other substances	20.34

After complete fermentation, lasting long enough to allow of the interchange of water between the pulp and the skins, and finally of the pomace becoming impregnated with a homogeneous liquid, all the vegetation water of the skins, pips, and stalks unites with the remaining 300 litres (66 gals) of juice.

Thus the amount of water would be for the 1000 kg of the grapes under consideration :

For the skins	90.65	×	0.768	=	69.62 kg.
» » pips	15.69	×	0.348	=	5.46 »
» » stalks	40.7	×	0.796	=	32.42 »
Total					<u>107.50 kg.</u>

The 300 litres of fermenting juice are thus united, by means of osmotic exchanges, to the 107.50 litres of water to form a homogeneous whole. If also the amount of sugar present is as allowed for by MM. Girard and Lindet — 14.09 per cent. of the pulp weight — the juice in question contains 150 gr. per litre, capable of giving a "de goutte" of 15 per cent.

the liquid impregnating the pomace consists of : 300 litres of juice per cent. of sugar, plus 107 litres of water of vegetation from the diffe- organs, and will only be capable of furnishing 3×8.57 of alcohol, 71, which, divided between 407 litres, gives an alcohol content of 6.61 per cent.

In this case, the "vin de goutte" extracted for white wine will show a difference of 1.96 per cent of alcohol in favour of white "vin de goutte" over red with red "vin de goutte", whether obtained by pressure or diffusion.

This coincides with what is often found in practice, and even the difference between "vins de marc" and "vins de goutte" may be still more marked, if instead of limiting the extraction to 500 litres per 1000 kg., it is extended to 550 or 600 litres, or even more.

The method and the completeness of the crushing, or still more of the removal of the stalks, causes great differences in the composition of the wine and thus in that of "vins de marc". The result of perfect crushing, whether performed by the crusher alone, or by crushing followed by other mechanical operations, is to remove the pulp entirely from the pomace and thus to make the pomace much poorer in sugar, as the latter wine is derived only from the adherent pulp, and is also much lighter. The difference of composition and of density has a notable influence upon the quality of red "vins de marc" according to the fermentation method employed.

These differences are attenuated by the separation of the stalks, as fermentation removes from 2 to 5 per cent. of the water of vegetation. If the submerged-pomace fermentation system is used, whatever the shape of the grapes which are crushed, there is no difference between "vin de goutte" and "vin de marc". For all the water of vegetation is found in the mass, the intercellular exchanges take place during the whole fermentation period, and this water of vegetation is distributed throughout the pomace, especially if the liquid has been well mixed during the fermentation process. If, however, it is a question of floating-pomace fermentation, differences occur, and these vary according to whether the crushing has been complete, or not, whether the fermentation, always with floating pomace, is carried out in tuns, or in vats with vertical sides; whether or not stirring by drawing liquid from the bottom of the vessel and pouring it back at the top during fermentation, has been practised or not, and also according to the ripeness of the grapes.

The shape of the vessels, tuns or vats, may be of importance, in so far as it hinders or allows the rising of the pomace and the formation of the "vin de goutte".

In tuns, which are normally full, the submerged portion of the pomace is always larger, approaching nearly to the submerged-pomace type of fermentation. The difference between "vins de goutte" and "vins de marc" would be very slight and often almost nil, if it were a question of a completely ripe vintage, which has undergone a merely rudimentary fermentation; the "vins de marc", whether obtained by pressure or diffusion,

are more alcoholic than the "vins de goutte". This is explained by the fact that the accumulation of sugar in the grape proceeds from the periphery to the centre during the ripening. Also, if it is a question of a grape which has been little crushed, it is just the poorest part of the grape which is expelled: and this forms the "vin de goutte". The pulp which adheres to the skins may be much richer in sugar, and able to more completely counteract the influence of the water of vegetation contained in the pomace.

When fermentation takes place in vats with vertical sides, or in partially filled tuns, the immersion of the pomace may be very variable; the difference between "vin de goutte" and "vin de marc" will be increased with the completeness of pressing, the pomace being lighter the immersion least. This difference will also be augmented by the fermentation being shorter after the formation of the pomace cap, as immersion increases till, in time, it is complete; and also by the greater ripeness of the vintage, for when the grapes are quite ripe, the pulp adhering to the residuum is no richer in sugar than that which forms "vin de goutte".

In vats and tuns alike it may also happen in the case of unripe, little crushed grapes, that the "vin de marc" is richer than the "vin de goutte".

These are undeniable facts and relatively newly discovered, as it could not be observed while wine-making methods and apparatus were primitive. But, whatever decrease there may be in alcohol content, "vin de marc", whether the result of pressing or diffusion, should not present habitual characteristics of watering. In fact, if the skins, stalks and pomace bring sufficient water of vegetation to cause a diminution in the alcohol content, they also supply soluble acid and neutral compounds, which enter into the composition of the wine and give it normal analytic character.

65 - Peanut Butter.

BRATTIE, W. R. — U. S. Department of Agriculture, Bureau of Plant Industry, Circular No. 98, 14 pp. Washington, October, 1912.

In the United States several large factories and a number of smaller ones are now devoted to the manufacture of peanut butter with a view to supply the rapidly increasing demand. Some of the larger factories are almost models in their construction, equipment and management, while many of the smaller establishments which have no elaborate equipment, are turning out an excellent product.

Peanut butter consists merely of fresh roasted peanuts ground and salted. It is calculated that in 1911 about 1000 railway carloads of shelled peanuts, or 1 000 000 bushels, were used in the manufacture of this food.

In order to produce high class peanut butter the best of materials and the utmost cleanliness are necessary; consequently it should be prepared in premises attached or adjacent to a peanut cleaning establishment, on account of the dust.

in the United States two distinct types of peanut are grown, the Valencia or Jumbo (including the varieties known as Virginia Bunch, Valencia Runner, and North Carolina or Wilmington) and the Spanish (including the true Spanish, Georgia Red, Tennessee Red, and Valencia).

Three grades of shelled goods of both types are prepared. In each No. 1 consists of whole kernels, No. 2 of split kernels and No. 3 of finely broken and badly shrivelled ones. The use of the latter in the manufacture of the butter should be discontinued. The best of the Spanish and Valencia and the cheaper grades of the Virginia type of peanuts are commonly employed for the production of peanut butter. An admixture of the Spanish peanuts gives the product a finer degree of smoothness, but butter made from Spanish peanuts alone contains too much oil. The writer suggests the possibility of using them having extracted from them 8 to 10 per cent. of the oil by press. Peanut butter of the proper consistency contains 41 or 42 per cent of fat.

The successive manipulations that the peanuts are submitted to for the preparation of the butter are the following:

1. Roasting at about 160° C. for 30 to 35 minutes.
2. Rapid cooling by a cold air blast.
3. Blanching, that is removal of the outer red skins and the like.
4. This is accomplished by means of blanching machines consisting of a set of brushes revolving against a corrugated plate.
5. Hand picking for the removal of small pebbles, discoloured inferior nuts, etc.
6. Blending of the different kinds of peanuts used.
7. Salting with 1 1/2 to 3 per cent. in weight of salt.
8. Grinding to a fine granular form.
9. Bottling and packing.

The writer describes with full particulars each of the above operations as well as the necessary plant, and gives illustrations of some of the model factories.

PLANT DISEASES.

GENERAL INFORMATION

Royal Decree of Nov. 8, 1912, regarding the Regulations for the creation of a Phytopathological Service in Belgium.

Arrêté royal du 8 Nov. 1912, portant règlement concernant la création du Service phytopathologique spécial, l'inspection des cultures horticoles et des pépinières, ainsi que l'importation et l'exportation des produits de ces cultures et plantations.—*Moniteur belge*, Year 82, No. 322, pp. 7458-7464. Bruxelles, Nov. 17, 1912.

Article 12 of the rural code, amended by the law of June 27, 1912, regulated in the following terms:

The measures to be adopted for the destruction of caterpillars and for the uprooting of thistles and the destruction of injurious insects are determined by Royal Decrees. Those which have for their object the prevention of the introduction into the country or of the propagation of insects or other animals, or of cryptogams and other plants, which are injurious to crops, are likewise regulated by Royal Decrees." or the execution of this law, a decree was passed on Nov. 8, 1912, in the following terms:

1. *Special service of phytopathological inspection.*—An inspector is entrusted with the direction and scientific control of the special service of phytopathological inspection. Assistant experts are appointed to aid the inspector in drawing up the necessary certificates for the dispatch of horticultural plants abroad. (Art. 1).

All matters of the special service of inspection, both in the interior of the country, or on the frontiers, are regulated by Ministerial Decrees (Art. 2). Every owner or tenant who cultivates or keeps horticultural or nursery plants under glass or otherwise, is obliged to permit the grounds to be visited by the inspector of the special service of inspection, or by the experts mentioned in Art. 1. All dealers in the plants under supervision are required to allow the contents of the parcels of plants for export to be inspected at any time (Art. 3).

2. *Transit.* Art. 4.—"Plants imported for transit are subject only to the conditions prescribed by Art. 6 of the Royal Decree of Sept. 15, 1885, regarding the execution in Belgium of the regulations of the International Phylloxera Convention."

Art. 5. — "Independently of the formalities prescribed by the Decree mentioned in the preceding article, the exportation and import of the plants referred to in Art. 3 are regulated by the following provisions."

§ 3. *Importation.* Art. 6. — "The importation of horticultural or nursery plants attacked by insects or plants injurious to crops is forbidden."

Art. 7. — "The Minister may order the return of such plants and restrict their importation to certain Customs Offices named by him with the common consent of the Minister of Finance."

Art. 8. — "In certain serious cases, he may forbid the entry of certain species or varieties of the said plants coming from the countries he may designate."

"In default of taking this measure, he can order the production of certificates to the effect that the plants presented for import come from cultivations free from injurious insects or plants, and that the plants are free from such insects or plants."

"The examination of the plants sent can take place at the frontier on arrival."

Art. 9. — "In cases where the plants dispatched to the interior of the country are recognized as being attacked by injurious insects or plants, the Minister has the right to decree their destruction at the cost of the importer, who is not entitled to any indemnity."

§ 4. *Exportation.* Art. 10. — "No horticultural or nursery plants can be sent to foreign countries, unless they have been certified as entirely free from injurious plants and insects by the Inspection Service according to Art. 11."

Art. 11. "The grower, whatever his status, of such a cultivation of plants as is mentioned in Art. 3, where the special Inspection Service has testified to the presence of an insect or plant, which it recognizes as harmful to plantations, is held responsible for its destruction."

"Until the destruction of the injurious insect or plant is effected, the Inspector of the Special Service is required to refuse the phytosanitary inspection certificate mentioned in Arts. 14 and 15."

Art. 12. — "All plants destined for the United States, or for any other country determined by the Minister, have, before exportation, to be provided with a certificate to the effect that they come from sources free from plants and insects injurious to cultivations."

"Such goods as do not comply with this regulation, cannot be admitted for transport."

"When the plants sent have not all been grown by the sender, the latter is required, under penalty of the application of Art. 17, to assure him in every case that the other plants also come from sources which have also been certified by the special Service as free from injurious plants and insects. To this end, the sender has a right to demand the production of the inspection certificate which the grower has received."

Art. 13. — "In special cases, the Service Inspector can, on condition that the persons interested conform to his instructions, give permission

plants exported directly from abroad, together with the products of plantations which have conformed with the provisions of Art. 10".

rt. 14. — "The Certificate mentioned in Art. 12 is granted by the Inspector of the Special Service. Its granting depends upon an inspection certificate drawn up by the said Service and affirming that the cultivations conformed with the regulations contained in Art. 10".

The Minister fixes the time for which this certificate is valid".

rt. 15. — "The inspection certificate can be obtained gratuitously by the grower of horticultural plants on application to the Inspector of the Special Service and on observing the conditions laid down by the Inspector".

rt. 16. — "At certain times, which are fixed by ministerial decree, the Inspector of the Special Service, aided by assistant experts, inspects the plantations of the persons making the declarations and carries out the necessary investigations".

When the cultivations can be considered free from injurious plants and insects, the Inspector of the Special Service grants the inspection certificate".

The latter is refused, when, among the inspected places, plants are attacked by injurious insects or plants".

rt. 17. — "The inspection certificate is refused, or withdrawn, in the case of the non-observance of part 3 of article 12, or when the cultivator's cultivations to be inspected only determine these partially, or does not obtain under the Special Service Inspector the necessary assistance to enable him to carry out the requisite investigations".

Such refusals are announced to the Minister by the Inspector of the Special Service within three days. The same procedure is observed in the case of a refusal of the certificate based on part 3 of the preceding article".

The last § deals with the research of the infringements of the regulations and the penalties incurred by non-compliance.

A ministerial decree of Nov. 9, 1912, regulates the inspection of horticultural and nursery cultivations; to this is appended a circular, addressed to the Governors of the Provinces, dealing with the above decrees.

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

On the Effect of Falls of Temperature on Vines, in Connection with "Bramble-leaf" (1).

ERRI, L. Ricerche sulle cause dei deperimenti delle viti in Sicilia.

II. — Contributo allo studio dell'azione degli abbassamenti di temperatura sulle viti in rapporto all'arriccamento, 210 pp., 97 figs. Roma, 1912.

According to the writer certain solid endocellular fibres are commonly found in the tissues of all those vines in Sicily or on the main-

land which are sickly in consequence of the attacks, of "bramble-leaf" or "roncet". These fibres are found both in American and European stocks, and in the grafted as well as in the ungrafted vines, and in the above ground parts of the plants.

These formations are identical with those already well known in wood of conifers ("Balken" of Sanio). These endocellular fibres are not formed in vines affected by other forms of distortion. Their formation precedes the exterior manifestations of bramble-leaf, and similar to these, they are transmitted by cuttings; their formation is caused by a fall of temperature during the growth of the plant.

The distortion of the shoots produced directly by late frosts is the same, morphologically or genetically, as that produced by bramble-leaf. The action of cold, necessary for the formation of these fibres, does not produce directly distortion of the shoots. The sensibility of the cambium and of the other tissues to this particular action of the cold increases after they have once been injured.

The process of the formation of the fibres may be considered as a consequence of the deviation of a normal process which takes place during mitosis under the influence of the fall in temperature. This perturbation lasts, and is transmitted also to the cells which originate from those first injured, independently of a repetition of the cold.

Those conditions of structure of the soil and of aspect of the vine which usually favour the ordinary ill effects of cold, and which have been found to further the appearance of bramble-leaf, may be considered as predisposing and perhaps complementary factors in the special action of cold in forming the endocellular fibres.

It is very probable that the manifestations of bramble-leaf and endocellular fibres are effects of one and the same cause, but hitherto this has not been demonstrated experimentally.

The practical measures suggested by the facts which have been ascertained by the writer's researches concern principally the necessity of establishing experimental nurseries with a view to finding the means of protecting the mother plants from the injurious effects of the cold climate.

BACTERIAL AND FUNGOID DISEASES

- On the Weather Conditions that favour the Breaking out of Vine Mildew.

SAVOLY, F. Ueber die Lebensansprüche der *Peronospora* der Rebe an die Witterung. *Centralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten. Zweite Abteilung*, Vol. 35, Nos. 17-19, pp. 466-472. Jena, October 30, 1912.

In 1907 Prof. Gy. v. Istvánffi, Director of the Ampelological Station of Budapest, being engaged in research on the life history of the vine mildew, decided to study more closely the very important influence of

rather has upon this fungus. What was contemplated was not a preliminary experiment, nor the determination of the special conditions of the infected wine-growing district; but an experiment on a grand scale should afford a sound arithmetical basis to the relation existing between the attacks of mildew and the course of the seasons in the whole of Hungary, taking into consideration the great diversity of conditions prevailing in the various parts of the country.

The vine thrives well, at suitable altitudes, in the whole of the country, the general configuration of which may be likened to that of a basin, the bottom of which is formed by the extensive Alföld, a plain situated at from 80 to 100 metres (270 to 330 feet) above sea level, bounded on the sides by the chain of the Carpathians with the gentle slopes of the surrounding hills. Whilst the isohyets lines, both the yearly ones and those of longer periods, are situated concentrically round the Alföld, which is the relatively driest part, the isotherms run almost parallel to the lines of latitude.

The future publication will contain all the details of the experiment, the methods employed and of the results obtained; this paper is only a preliminary communication.

Beginning with the year 1907, all the data given by the agricultural stations of the country during the preceding ten years on the relation between the outbreaks of mildew and the weather were collected and examined. The result was a confirmation of the well known fact that mildew prevails and is especially severe in wet years. Another observation of greater importance than the above general result was the recognition of the individual behaviour of some regions, distinguished by special meteorological conditions, towards mildew.

In addition to the meteorological data, those supplied by the Government stations were utilised; the data on the mildew invasions were collected with the assistance of thousands of farmers living in all parts of Hungary, who were requested to forward to the Royal Ampelological Station suspected diseased parts of vines on the very first suspicion or appearance of mildew. The material thus collected was examined at the Station.

It was laid upon collecting data referring to the first outbreaks of mildew, inasmuch as only these have any value in establishing a connection between mildew and the course of the weather. In order to be sure of the exactness of the data collected, the administrative district was considered as the unit of area in respect to the outbreak of the disease, and it was held to be infected from the date on which the first notice of the disease was sent in. The confirmation of the intelligence was given by the subsequent notices which followed from other, from the same district. On the other hand, the probability of the information really gives notice of the first appearance of the disease diminishes as summer wears on; and the notices act as a check on each other when in successive years those from neighbouring districts come in in the same order. In such cases the belief is justified that

certain external conditions exist which favour the appearance of it earlier in some localities than in others.

In order to diminish the probability of error, the dates of the appearance of mildew were grouped in periods of unequal length, each comprising a greater number of days as the season wore on, thus offered an increasing probability of likelihood. The first period of 2 days, the second of 3, the third of 10, the fourth and the fifth of 15 each, the sixth and the seventh of 31; the total period extending from the middle of May to the end of August. Further, all the dates were considered only when grouped together in averages. For the detailed investigations the material collected during 1910 and 1911 was used. Two thousand cases of mildew were recognised in the material sent to the Ampelological Station; of these, two hundred in each of the two years indicated the outbreak of the disease in a given district. The dates of the first appearance of mildew were grouped in periods of gradually more distant from each other and plotted out on a map, rounding each group with a line. The curves thus obtained are by the author the "isophanes" of mildew.

The graphical representation of the dates on which mildew appears show that the same dates or those near to each other are connected by a series without interval. This proves undoubtedly that the contemporary outbreak of mildew is caused by contemporary weather conditions favourable to infection, and it is easy to recognise in the sinuosities of the isophanes the lines which mark the quantities of rainfall in each period.

This forms a first basis for the valuation of the biological value of climatic conditions in regard to mildew.

The isohyets of the greater quantities of rainfall in April at the beginning of May nearly coincide with the lines of the first isophane. In the same manner as the isohyets of given periods of rain represent diminishing quantities, the isophanes represent successive and increasing periods of time. Consequently the quantity of rainfall influences the date of the outbreak of mildew, or in other words, the spread and probability of the intensity of the disease are determined by the gradient of the rainfall. Inverting the postulate, it may be said that from the gradient of the rainfall in a district the first appearance and the trend of the further course of the parasite may be deduced.

It has been further observed that the later isophanes enclose earlier ones: it may therefore be affirmed that, within the limits of the range, the fungus does not make its appearance here and there at haphazard but that it follows an uninterrupted course, which seems to depend on certain determined circumstances.

As is proved by the isophanes, the spread of the disease depends to such an extent upon climatic conditions and the physiographical character of the soil, that one might almost deny the efficiency of any means of control if it were not for the fact that it is just the incompleteness

played application that explains how the disease can continue its progress, though with diminished intensity.

As is to be expected, the condition and configuration of the land exert an influence on the isophanes: Extensive wooded regions, or mountains on which the vine does not grow, hinder the spread of the disease, river valleys, low-lying lands liable to floods, or those subject to drought, favour it.

As regards the meteorological factors, the temperature and the quantity and frequency of rain were recorded in every locality and for each period from the 1st of April, that is during the time in which the outbreak of mildew is possible.

Since equal intervals of time, though they lend themselves to meteorological observations, have (as the writer demonstrated by experiment) no value in connection with the life-history of mildew, because they do not always comprise days in which the weather is of the most varied or even opposite character, the writer limited himself to the factor rain, divided the time into periods of rainy days and of dry days. He determined the average number of rainy days, the frequency of the rain, the temperature of every single locality in which mildew appeared, for the periods both of rainy and of fine days from the 1st of April up to the date of the outbreak of the disease.

With the single averages for each isophane he calculated separately the average for that isophane during the dry periods and the rainy ones, then for the whole period from the 1st of April up to the date of appearance of mildew on that isophane.

By multiplying this number by the number of days that elapsed between the first of April and the date of the real outbreak of mildew, a coefficient is obtained in which each factor is represented.

This coefficient is called by the writer a *bios*. Though it may not have an absolute value, its practical utility cannot but be recognized. When mildew appeared on the 15th of May. Calculating the values of the *bios* for every isophane, the following results were obtained:

isophane	I	II	III	IV	V	VI	VII
bios . .	631	675	522	427	405	400	256

There is thus an uninterrupted diminution in the number of the *bios* from the first isophane, in which mildew broke out on the 15th of May. Admitting that the course of the weather is enough to cause the outbreak of mildew in the belt of the first isophane, when the value of the *bios* was 631, it may be asked at what date will the meteorological conditions in the meantime prevailing in the belts of the other isophanes cause the outbreak of mildew in them? With the help of the *bios* a simple arithmetical calculation shows that in respect to the first isophane mildew will appear in the

II	III	IV	V	VI	VII	isophane in days.
45	54	66	70	91	111	
(48)	(51)	(62)	(77)	(92)	(123)	

The numbers in brackets are those of the days that really passed before mildew broke out.

The same concordance between calculation and practical observation was recorded in the year 1910 and in the first half of 1912; during the latter period, in almost all the localities infested by mildew the value of the bios ranges from 600 to 650; and already in the month of May it was possible to foresee the course that the disease really took and the extent to which it spread.

Without the intention of generalizing his results, the writer concludes by expressing the wish that similar researches should be undertaken in other countries also.

69 - Fungi injurious to Rice in the Philippines. — See above, No. 68.

70 - Treatment for *Bremia Lactucae*, *Peronospora effusa* and *Heterosporium variabile* on Vegetables (1).

SCHNEIDER, NUMA. Traitement du Meunier des Laitues et Romaines et du Mildew des Epinards. — *Revue Horticole*, Year 84, No. 21, pp. 493-494. Paris, Nov. 1, 1912.

Lettuces and cos lettuces raised under glass after October for forcing purposes are often attacked by *Bremia Lactucae* (or *Peronospora glauca* *formis*). The writer has, during some years, found that a good method of controlling this disease is to cover old forcing beds, previously broken up and levelled, with an inch or more of pulverised white wood charcoal or twig charcoal, sowing the seeds not too deeply and covering them with a thin layer of powdered twig charcoal. The hot-beds on to which the plants were pricked out, were also covered with a layer of powdered charcoal, which was pressed down firmly so as to keep the leaves of the plants quite away from the soil. The treatment was completed by sulphur application on a fine day at the end of November, or in December. The same treatment can be applied to cauliflowers, raised under glass at the same season.

Dusting with sulphur has been found an efficacious remedy in the case of *Peronospora effusa* and *Heterosporium variabile*, parasites of spinach, as the first application had been removed by the rain, the process was repeated a second time, using a special bellows, and in such a manner as to reach the lower surface of the leaves.

At the time of gathering, only a very small amount of sulphur adhered to the spinach leaves, and this disappeared after they were washed.

The necessary quantity of sulphur for the treatment is very small.

(1) See also No. 418, B. Feb. 1912.

Infection Experiments with *Thielavia basicola* on Ginseng.

SENBAUM, J.: in *Phytopathology*, Vol. II, No. 5, pp. 191-196 + plates XVIII and XIX. Ithaca, October 1912.

One of the most common and serious diseases affecting ginseng has been attributed to *Thielavia basicola* Zopf. While several workers in different parts of the United States have observed the fungus associated with the disease, no definite inoculation experiments on this host have previously been reported.

The fungus is very widely distributed and has been associated with a wide range of hosts belonging to 11 entirely different families. It has been reported from Germany, Russia, Belgium, England, Italy and Korea. In the United States it has been reported from several States. In the case of ginseng, the fungus is able to attack plants of all ages, being especially severe on seedlings, where it is known by the growers as "fiber rot" or "end rot." It not only attacks the roots of seedlings and older plants, but has been found causing cankers an inch or more in length on the stems. Most commonly these occur at the point where the stems emerge from the ground. These cankers at first cause a discoloration, followed by a drying and splitting of the stem in a longitudinal direction, leading it to break over. The disease has been observed to attack the ginseng plant in soils of widely different physical characters; in many cases it seems to be just as severe on new land as on soil which has previously been used for growing several crops.

The writer reports inoculation experiments (inoculations of seedlings; inoculation of ginseng in the soil; inoculations on stems) of *Thielavia basicola* obtained from three different hosts, namely cotton, tobacco and ginseng. The conclusions arrived at from the results are the following:

1. From comparison of cultures from different hosts on various media, from infection experiments and from measurements of spores and hyphae, it appears that the forms of *Thielavia basicola* Zopf found on the three different hosts, cotton, tobacco and ginseng, are identical.
2. While infection without previous injury to the ginseng or tobacco plants was obtained in the case of young plants, this is apparently not the case where older plants are used.
3. The fungus is able to attack the aerial as well as the underground parts of the plant; at least this proved to be the case with ginseng.

Apple Leaf Spot.

BROOKS, CHARLES and DE MERITT, MARGARET: in *Phytopathology*, Vol. II, No. 5, pp. 101-106 + 1 plate. Ithaca, New York, October 1912.

The paper under review is a report upon the cause and nature of the apple leaf spot and includes data and discussion in regard to inoculation experiments with various fungi, studies on different forms of *Sphaeria*, *Ascomyces*, and experimental work on time of infection, influence of cultivation and methods of control.

Spray injury, intense sunlight following showers, frost, and a number of different fungi, including *Coniothyrium pirina* (Sacc.) Sheldon (form-

erly known as *Phyllosticta pirina*), *Phyllosticta limitata* Pk. and *Sphaeropsis malorum* Pk., have been credited with causing the disease. Inoculation experiments were made by I. M. Lewis in 1908-1909 with spores from pure cultures of *Sphaeropsis malorum*, *Coniothyrium pirina*, *Conium foliosolum*, *Alternaria* sp. and *Fusarium* sp., which had been isolated from the affected areas, but only negative results were obtained.

The writers have made a study of *Sphaeropsis malorum* from different sources and have isolated three strains or types that are particularly distinct. The first has broadly conical unilocular pycnidia and produces oblong spores measuring 12×26 to 38μ ; the second produces egg-shaped spores measuring $14 \times 23 \mu$; the third is characterized by a distinctly multilocular pycnidium; all three forms are ostiole-bearing. The first strain is the most common on cankered limbs, but pycnidia of the second form were found several times in such positions.

The cultures obtained from leaf spots always produced pycnidia of the first form.

Only the first form of pycnidium was found on the fruits of apples and quinces in the field. All three forms were obtained in cultures from spots on apples, but the first was much more common than any of the others.

From the inoculation experiments made with the three strains on the foliage and fruit, the writers conclude that: 1. The leaf spot on apples as it occurs in New Hampshire orchards may be produced by *Sphaeropsis malorum* Pk. and is probably largely due to that fungus. 2. Of the several strains of *S. malorum* which may be obtained from the field, the large-spored form is largely responsible for the production of leaf spots. 3. Infection may occur from the time the leaves unfold till the late autumn. 4. Cultivation, spraying and the removal of cankers are important in the control of the disease.

Either Bordeaux mixture or lime-sulphur is an efficient remedy for the disease; but as under New Hampshire conditions Bordeaux mixture injures the leaves of Baldwin and other varieties, lime-sulphur is to be more satisfactory.

75 - A new *Gnomonia* on Hickory Leaves.

WOLF, FREDERICK A.: in *Annales Mycologici*, Vol. X, No. 5, pp. 488-491 + pl. XI, 1912.

Upon the leaves of the shag bark hickory (*Carya ovata* (Mill.) K.), in the vicinity of Auburn, Alabama, one finds in late summer and autumn an imperfect fungus, *Gloeosporium Caryae* Ell. & Dearn. This fungus is characterized by the formation of large diseased areas, 1-2 cm. in diameter, reddish-brown in colour, without a well-defined margin. In case the affected areas become confluent they exceed this measurement in extent and are irregularly outlined. Minute brown pustules, the acervuli of the fungus, are present in abundance upon the lower surface of the diseased areas.

Affected leaves were collected by the writer during the autumn and winter. By May 4th mature perithecia had been found.

areas occupied the preceding autumn by the *Gloeosporium* stage. examination showed that this perithecial stage agreed morphologically with that of the genus *Gnomonia*. This fungus had been cultured with the conidial and the ascosporic stages. In order to add further to the identity of the two forms inoculation experiments were attempted. Inoculation upon hickory leaves with pure cultures of ascospores (the *Gnomonia* stage) resulted in infection and the subsequent development of the conidial stage (*Gloeosporium*). These conidia, when used for inoculation, resulted in the production of acervuli and conidia. Inoculation in the field with pure cultures of both the ascosporic and conidial stages made by laying small pieces of the infected material upon the under surface of leaves, produced infection. A new name, *Gnomonia Caryae* (I), is proposed for this perfect stage. Detailed descriptions of both stages of the species and detailed illustrations are given.

Withering of the Plane Tree due to *Gloeosporium nervisequum*

LINO, P. Il secume del platano.—*L'Italia Agricola*, Year XLIX, No. 21, pp. 508-509. 1 coloured plate. Piacenza, Nov. 15, 1912.

In some years past, the plane trees of the avenues of Turin and neighbourhood have been subject to withering due to the attacks of *Gloeosporium nervisequum*. Hitherto, the fungus has only appeared on the leaves, which it caused to wither along the course of the primary secondary nerves, the petiole also being affected. The infected leaves matured at the beginning of spring and the growth of the plant was completely interrupted, but only for a short time, however, for fresh leaves arose from new buds, and a change in the conditions in their environment having taken place they were immune from the attacks of the fungus. In 1912, however, the disease appeared in a more serious form, having already been observed in other parts of Italy in 1905 and in 1911 during the last few years.

The fungus, instead of attacking the nerves and petiole only, extended its attacks to the nodes from which the leaves arise, and where the axillary buds are formed; it spread along the bark above and below the node, penetrating into the woody tissues, where it produced many black projections, which contained the reproductive bodies of the parasite. The young buds died, the foliage in some cases was completely destroyed, and the nutrition and further growth of the tree were much impeded. In 1912 the disease made its appearance in this aggravated form for the first time. In years in succession, the trees would suffer severely.

Prof. Geo. F. Atkinson, Cornell University, Ithaca, N. Y., is of the opinion that *Gnomonia Caryae* Ell. & Dearn is identical with *Dicranospora rugulosa* B. & C. (The Author).

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS.

75- The Chief Russian Species of Dodder.

LARIONOW, D. Die Hauptarten der Russischen Seide und ihre Massregeln. —, der Samenprüfungsanstalten am kaiserlichen botanischen Garten zu St. Petersburg, Part 4, p. 27. St. Petersburg, 1912.

This communication gives a description of the biological character of *Cuscuta*. The writer considers *Cuscuta* to be an annual plant, attributes its passing the winter to the germination of its seeds in a producing winter forms. *Cuscuta obtusiflora*, H. B. K. var. *breviflora*, occurs in the Government of Astrakan on red pepper, and even on potatoes; this species is one of the rarest and occurs sporadically.

C. Epithymum Murr. is met with on *Papilionaceae*, *Labiatae*, *Ranunculaceae* and *Crupina vulgaris* and is of very wide-spread occurrence. A district in which this species is abundant is the neighbourhood of Simferopol (Crimea).

C. racemosa Mart. has begun to spread in the Government of Ekaterinoslav and Chernigov. *C. planiflora* Ten. is abundant in Crimea, Caucasus and Central Asia; the lucerne of Turkestan is attacked by it. *C. europaea* L., which is common everywhere, attacks hops, tobacco, hemp, poplars, alders, stinging nettles and *Lycium barum* L.

C. Epilinum Weihe is found on flax in the Baltic Provinces, the Governments of Jaroslav and Kursk, on *Camelina sativa* in the Government of Kiev, on *Lolium* and *Spergula*; it occurs sometimes not often, in clover seed.

C. cupuliformis Kroecker is found on garden trees and on flax. This species, especially in the south, is very wide-spread. *C. muhlenbergii* Vahl. is also parasitic in the south on *Lycium barbarum*, *Prunus domestica*, *Salix*, *Artemisia* and *Helianthus*.

The writer draws attention to the fact that it is necessary to take energetic measures for the control of dodders when they are weeded in the spring. The fields should be ploughed over and sown with buckwheat and millet, and burning should also be resorted to if necessary.

It is very necessary that seed control stations be established and that sacks be sealed. The writer advises inspection on the frontier for the purpose of preventing the introduction of dodder-infected clover seed to Russia. The sacks which have been sealed at foreign seed control stations, need not be subjected to inspection.

Bersim Dodder (*Cuscuta aegyptiaca* n. sp.).

LABET, I., La Cuscuté du Trèfle d'Alexandrie, *Cuscuta aegyptiaca* sp. n. - *Bulletin de Société botanique de France*, Vol. LIX (Series 4, Vol. XII), 1912, 6, Séances de 1912, pp. 489-491, plate XII. Paris, Nov. 13, 1912.

In 1912, as a result of the importation of bersim (*Trifolium alexandrinum*) seed direct from Egypt, a dodder appeared in Algeria, which is common in the Egyptian crops and is called by the natives "hamouï". Bersim dodder spreads very rapidly and grows at a remarkable

Unless energetically suppressed, this parasite hinders seed production, for it is especially the last spring shoots, which flower and bear seeds, that this dodder attacks. The pest seems to follow bersim wherever it is cultivated. The species of *Cuscuta* in question was observed for the first time by Lippi, who named it *Cuscuta aegyptiaca*. Later, Fresco called it *C. arabica* and described a specimen from Sinai; this name was used subsequently by other writers.

The study of a large number of specimens decided the writer to separate bersim dodder from *C. arabica* Fres. It appeared to him, that the *C. aegyptiaca* used by Lippi should be resumed to distinguish this species; though probably derived from *C. arabica*, it has already acquired sufficiently distinctive characters to prevent its being confused, even with this very near ally. It is under the name of *C. aegyptiaca* n. sp. M. Trabut gives a systematic description of the plant studied.

On the Properties of Germination of the Seeds of Different Weeds.

IMBEL, HERMANN. Untersuchungen über die Keimungsverhältnisse verschiedener Unkräuter. — *Landwirtschaftliche Jahrbücher*, Vol. XLIII, Part 2, pp. 215-331. Berlin, 1912.

The writer has made a series of experiments with regard to the germination properties of various weed seeds: charlock, wild radish, false oat, lower, etc.

One result, among others, of these experiments was that the seeds of charlock should be numbered amongst those that germinate best under influence of light. Comparative experiments made in light and in darkness, showed the great importance of the condition of the seeds (age, stage of maturity, etc.) as regards the germination process and the secondary played by temperature and its variations.

Exposure to strong sunlight may be highly injurious to germination of the seeds, which should be carried at least to the degree of dryness, as a rule augments the germination percentage. But at great depths in the soil even a whole period of drought has no influence on germination. Cold had an unfavourable effect on the seeds left on the surface of the soil in the open in winter: false oat, charlock, radish and lower. In the case of false oat, injury occurred even when the seeds were covered with soil. The depth at which the seeds germinate, and their development, depend much on the nature of the soil.

Seeds of charlock may be of different colours, but black is their normal colour, brown denoting abnormal maturation and arrested development.

Under favourable conditions, charlock seeds develop beneath as much as 2.8 inches of soil. The optimum germination depth is, however 1.2 inches. The writer considers that amongst the common graminivorous birds the one of largest size may be considered important allies of the farmer in the control of weeds.

In preparing the food for domestic animals it is advisable to boil or chop up finely all fodder containing weeds, but even without this precaution the danger of the fields being infected by means of the live stock is less than it is supposed to be.

78- Tor-Grass or False Brome and its Eradication from Down Pasture

HUTCHINSON, HENRY P. in *The Journal of the Board of Agriculture*, Vol. XIX, No. 1, pp. 648-657 + fig. London, Nov. 1912.

Large areas of Down pasture land have little grazing value owing to the presence of the weeds *Brachypodium pinnatum* L. or False Brome, and *B. sylvaticum* or Slender False Brome; the former is the species chiefly met with in pastures. Whilst they have a low value as forage they spread rapidly; being perennial and tufted in habit of growth they soon crowd out the finer grasses and clovers. The plant is able to withstand excessive dryness owing to its extensive root system. It is spread from place to place by means of its seed which ripens in late summer and is carried by the wind. At the time of ripening sheep will eat the flower heads; in some districts advantage is taken of this fact to check the spread of the plant. Various measures have been tried with the object of eradicating the weed, but nothing entirely satisfactory has been accomplished. It is a regular practice in some parts to burn the grass annually, which renders the fresh growth more tender and more palatable to stock than the older shoots, and if the operation be carried out sufficiently early in the season, flowering is prevented and further spread of the plant checked.

At the farm of the South Eastern Agricultural College at Wye, the writer tried several methods of control.

Quicklime. — In November some tufts of tor were covered with about 2 inches of quicklime. In the spring the young shoots failed to grow, but later in the summer growth proceeded as vigorously as before.

Better results were obtained from the following treatments:

1. *Application of Salt.* — In May, three small plots of tor, each about 2 perches in extent, were treated with brine of different strengths. The salted plots were much relished by the sheep and cattle and the grass was eaten down close, but after the salt had been washed away by the rain grazing almost ceased on these plots and the tufts developed again, but no flowering occurred.

2. *Digging.* — In the spring of 1909, 3 perches of tor-grass were cleared by digging. The turf was thrown aside — the soil by this means being removed to a depth of 3 or 4 inches and the subsoil exposed. The latter was forked over, brought to a fine tilth and sown down with a suitable mixture. The seeds germinated satisfactorily, but the plants were weak and the sward ultimately formed was thin. This is what might have been

ted, since the readily available plant food was removed with the turf, the soil as a rule is thin on the hill sides. It is unnecessary to dig more than 3 inches in order to eradicate the weed.

3. *Digging and Burning*. — In March 1910, 6 perches of tor-grass cleared by digging. The turf was allowed to dry, then barrowed into heaps, and burnt slowly, the heaps being completely burnt out after about twelve days. The fine ashes and burnt earth were spread over the cleared plots, which were then ready for seeding, and no new tor-shoots appeared afterwards, as the digging had been done carefully and no small pieces of stem had been left in the ground. This method though is expensive, about £5 10s. per acre.

4. *Application of Gas-lime*. — In March 1910 on about 12 perches the turf was dug out and while still green built into heaps; gas-lime mixed with it, being distributed between the layers of turf; the bare ground was also covered with gas-lime. About 1 cwt. of gas-lime per perch was used in the mixing and $\frac{1}{2}$ cwt. spread. The heaps were allowed to rest about three months and in June were thrown back over the cleared area. The cost of the treatment was the following:

Cost of digging, etc.	4 d. per perch
„ „ gas-lime	1 d. „
„ „ carting, etc.	1 d. „
<hr/>	
Total cost of clearing	6 d. „
	<hr/>
	= £24 per acre.

It is very probable that less gas-lime than the quantity used would have been efficacious.

5. *Another Application of Gas-lime*. — On another plot of tor-grass of 12 perches in extent, two loads (about 34 cwt.) of gas-lime were broadcast over the area as evenly as possible. In June, two months after treatment, all the grass appeared to have been killed. The cost was the following:

Cost of gas-lime	2d. per perch
„ „ carting	2d. „
<hr/>	
Total cost of clearing	4 d. „
	<hr/>
	= £2 13s. 4 d. per acre.

Other experiments were made to ascertain the minimum quantity of lime required and it was found that it must be applied, as fresh as possible, at about $2\frac{1}{2}$ cwt. per perch. Five months, at least, should elapse between the time of application to the time of re-sowing. The lime can be applied effectively at any time during the year, but autumn and early winter to be the most favourable.

Where gas-lime cannot be obtained, the best method of eradication is to dig the tor-grass out with a suitable spade to a depth of three inches. Where large patches occur on land which is not on too steep a slope,

the tor might be ploughed out. The turf would require to be kno about with harrows until dry. It should then be burnt or left until by the weather. Flowering should always be prevented by mowing, ing with sheep, or burning, and young tufts should be grubbed out and whelp first seen.

INSECT PESTS.

79 - Aphid Notes from California.

DAVIDSON, W. M. in *Journal of Economic Entomology*, Vol. 5, No. 5, pp. 40, Concord, N. H., October 1912.

The paper under review reports several plant-lice not heret found in California, of which three species are new to science. A sexual forms are also dealt with and illustrated.

The species here recorded are the following:

Cerataphis lantaniae Boisd., taken on ferns in greenhouses; *Aphis coweni* Gillette (syn. *Cryptosiphum tahoense* Davidson); *Calaphis tulaccolens* Fitch, whose sexual forms occur in November on cultive birch; *Calaphis castaneae* Buckton,* whose sexual forms occur in e November on chestnut; *Euceraphis betulae* Kalt., whose sexual fema abundant on cultivated birch in November; *Euceraphis flava* sp. n not uncommon on the under side of the leaves of *Alnus rhombif* Nutt.; *Aphis cardui*, forming colonies on the young growth of sev thistles throughout summer; *Aphis atriplicis* L., occurring on the r side of the leaves of *Chenopodium murale* L., the sexual forms app ing in August; *Aphis salicicola*, abundant on willows throughout summer, preyed on by the larva of a *Leucopis* (Agromyzidae); *A maidis* Fitch, colonizing corn; *Amphorophora latysiphon* sp. nov., oc ring sparingly on the periwinkle (*Vinca major*) and *Convolvulus arvens* *Phorodon carduinum* Walker, on the under side of the leaves of artich becoming a pest; very susceptible in California to fungus diseases; *A zuz varians* sp. nov., occurring on wild clematis (*Clematis ligusticif* Nutt.); *Amphorophora rubi* Kalt., colonizing the terminal shoots of cu vated blackberry and loganberry and occurring also on the wild thimble berry (*Rubus nuthanus* Moc.); *Macrosiphum chrysanthemi* Oestl., on t young shoots of a composite; *Macrosiphum granarium* Kalt., on vari grasses in spring; *Macrosiphum solanifolii* Ashm., on wild lettuce.

80 - The Vine Moth Caterpillar Parasite (1).

FRENCH, C. in: *The Journal of the Department of Agriculture of Victoria*, Vol. X, Pt p. 552 + 1 plate, Melbourne, September 1912.

During the period from January to April, 1912, many shrivelled and dark-coloured Vine Moth caterpillars were noticed on vine leav

(1) The Vine Moth is *Agrotis glycine* Lewin. See: FRENCH, *Handbook of the Descri Insects of Victoria*, Part II, pp. 107-107, Melbourne, 1893. (Ed.)

oria, Australia. On investigating the matter, the writer noticed a parasite had been at work and all the live caterpillars had clusters of eggs on their backs.

When the eggs of the parasite (a chalcid fly) are first deposited on caterpillars, they are exceedingly small, but soon develop. The larvae develop very rapidly, and spread all over the backs of the caterpillars. From the time occupied from the eggs being deposited until the larvae are grown, is about a week. About the second day after the larvae hatched, the caterpillars cease eating, and remain in one place, and at the end of the week they are simply sucked dry by the parasite. The caterpillars are dried up, the parasites cover them with a silken covering, and form their cocoons, emerging as perfect insects in a matter of weeks' time.

When the perfect Hymenopterous insects were hatched out in the collection box, live caterpillars of the Emperor Gum Moth (*Anthea* Scott) and several species of Cutworm Moth larvae (*Mamestra* and *Agrotis* sp.) were placed in the box, but the parasite did not lay eggs on them.

These parasites are reported to be doing good work this season in parts of Victoria, and it is hoped that they will keep the Vine in check.

The Life History and Habits of *Cheyletus seminivorus* Packard.

ING, H. E. in *Journal of Economic Entomology*, Vol. 5, No. 5, pp. 416-420. Concord, N. H., October 1912.

Cheyletus seminivorus Packard was first found in stored cabbage seed; the species, however, is not an enemy to seeds or to stored grains, for it is strictly carnivorous. When this acarid is found among seeds or in stored grain it is here only to prey upon some other species, which is the real pest. During the winter 1911-1912 the writer came into possession of a sample of milled wheat which was badly infested by Tyroglyphid mites. Mixed with these were found at first only a few individuals of *Cheyletus seminivorus* Pack. Some of these were selected to be used in a series of experiments upon the life history and habits of this species, and the results so obtained are here detailed. A few days after the sample was examined and it was found that out of 100 Tyroglyphids counted, 95 had been sucked by the *Cheyletus* and were dead, and only 4 were alive and active. Thus in a short period of only a few days this predaceous species multiplied and destroyed about 95 per cent. of the pernicious Tyroglyphids.

Lime-Sulphur Wash an Inefficient Ovicide for Codling Moth.

HO, V. I. in *Journal of Economic Entomology*, Vol. 5, No. 5, pp. 385-395. Concord, N. H., October 1912.

Reports have occasionally been published showing a decrease in codling moth infestation following applications of a lime-sulphur wash. Within the past few years a coating of lime-sulphur upon insect

eggs has generally been considered fatal. Only recently have experiments shown a surprising lack of insecticidal power in spraying aphid and spider eggs with lime-sulphur mixtures.

The paper under review is a report of a preliminary series of experiments conducted during the fall of 1911, in order to obtain data on the possible efficiency of lime-sulphur in killing the eggs of the codling moth. From an infested orchard, more than two hundred apple codling moth eggs had been deposited upon which codling moth eggs had been deposited. These eggs were examined and only the apparently healthy eggs were used in the experiment, which was carried on in a laboratory. At first an attempt was made to spray the apples by means of an atomiser. This method was given up as a failure because the spray collected in drops, covering only a small portion of the surface of the apple, in which case an egg was more frequently missed than hit. When the drops of spray were too large they would roll from the apple leaving a practically smooth surface. The same would frequently occur on shaking the fruit. This was the first indication of the inefficiency of a lime-sulphur spray in killing codling moth eggs. The failure of a spray to cover the egg deposited on the fruit is sufficient to exclude it as an ovicide, regardless of its efficiency in the laboratory.

The method finally adopted was to place a drop of the spray material directly upon the eggs. These were divided into four lots: 1) untreated; 2) treated with a one-to-30 dilution of lime-sulphur (30° B); 3) treated with lime-sulphur one-to-30 with arsenate of lead added at the rate of four pounds to 100 gals. of the diluted spray; 4) treated with a 5% solution of calcium polysulphides containing a slight amount of CaS_2O_3 . The eggs were treated on the day collected.

The detailed results are tabulated. They may be summarized as follows: 1) 90 of 93 eggs hatched; 2) 85 of 100 eggs hatched; 3) 23 of 23 eggs hatched; 4) 8 of 28 eggs hatched. "With these results, it is evident that lime-sulphur, even too strong for use on foliage and fruit, is at best an uncertain ovicide, and its effectiveness is of doubtful value economically."

(1) This method of specification of the "strength" of lime-sulphur, so often encountered in the literature, is uncertain, because a specific gravity determination of a lime-sulphur solution is really a reading of two (at least) solutions of unknown strength present in unknown proportions and of different degrees of chemical activity. The solutions are the calcium polysulphides (CaS_2 and CaS_3) and the calcium thiosulphate (CaS_2O_3). The polysulphides are by far the most active chemically and undoubtedly the most important insecticidal ingredient in lime-sulphur.

The nearest approach, at present, to a logical determination of the "strength" of lime-sulphur is a statement of the amounts present of calcium polysulphide and of thiosulphate. The writer used a 5% solution of calcium polysulphide as a more definite test in addition to a one-to-30 dilution of lime-sulphur, testing 30° B. .

Campaign against *Agrotis ypsilon* in India (1).

Communication from the Director of Agriculture, Behar and Orissa, to the International Institute of Agriculture.

In the Entomological Section of the Agricultural College at Sabour most important work during September and October 1912 was the campaign against *Agrotis ypsilon*. When the land was under water, the were set up on high lands near villages, and with the receding of flood water they have been moved down lower and arranged in line to our scheme of work. During the last two months, up to the end of October, 68 000 moths have been captured, which would, in the ordinary course of things, have given rise to 10 millions of caterpillars. Some first attacked areas have been picked off, and the number of castors destroyed is 53 000. Owing to the abnormal weather conditions prevailing in the Province, the crop on the land is not as satisfactory should be. The campaign work is getting on satisfactorily. The results of the work will be evident in another month's time. The potato-storing demonstrations have been wound up, as the season is over. A report on this work will be published later.

Insects injurious to Rice in the Philippines. — See above, No. 271

Moth Borer in Castor Oil.

in Rhodesia Agricultural Journal, Vol. X, No. 1, pp. 102-104. Salisbury, October 1912.

Experimental plantings of castor oil in the Transvaal and Rhodesia have shown that the insect factor is one of the more serious handicaps to the crop. This view has been amply supported by the results of a planting made in the spring of 1909 at the Experimental Station, Pietermaritzburg. By the 1911-1912 season practically every plant of the original planting was infested by *Duomites capensis*. It should be noted, however, that the plants which had grown from dropped seeds germinating in the spring of 1910 had not yet been attacked.

Several species of insects have been observed to damage the castor oil plants in Rhodesia, but by far the most harmful is the Moth Borer (*Duomites capensis*), which bores the stems and branches. The eggs are laid in clusters on the stem of the plants near the ground level and are yellowish in colour, smooth-surfaced and shiny. The method by which the larvae obtain entrance to the stem has not been observed, but it is probable that they make their first few meals inside the leaf buds and then enter the stems. The exit holes of the moths are always on the lower part of the stem or branches and the first hole is usually on the lower part of the stem.

The full-grown larva measures rather over 2 ½ inches in length; it is black and fleshy with prominent segments. The period of the larval

stage has not been accurately determined, but in this family (*Zonosen*) this period is sometimes prolonged over more than a year. This spe does not produce only one well-defined brood in the year, as half-gr larvae and full-fed larvae and pupae have been found in the same p at the same time, and some adult moths have bred out in May and gust, while the moths in the Transvaal have been recorded by Thom to have emerged in September and October.

The female pupa is nearly $1\frac{3}{4}$ inches in length and is a little la than that of the male, which sometimes measures as little as $1\frac{1}{4}$ inc. The female moth is considerably larger than the male and is provi with a prominent ovipositor with which to insert its eggs into crev in the plant. The attacks of these insects are frequently followed those of "white ants", which complete the work of destruction, thoroughly. Borers are amongst the most difficult of insects to att and several methods are suggested for their destruction; probably measures which are used in England against the "Goat Moth" wo be effective — a thick paste made of clay, lime and soft soap is smea over the stems and branches to prevent egg deposition.

To destroy the borer in the stems, a small piece of cyanide is sserted into the hole and the latter is stopped with clay. A few ce centimetres of carbon disulphide injected into the burrow and the b plugged is a method also likely to be very effective.

When the borers are killed by one or other method, the holes sho finally be stopped up with grafting-wax, or some other substance, to p vent the ingress of other insect-enemies and injurious fungi.

86 - *Leucoptera coffeella*, an Insect Parasitic on the Coffee Plant
Sao Paulo Brazil.

THEERING, RODOLPHO (von). Nossos cafezaes ameacados de una praga que ja' arriu os fazendeiros do Rio. — *Chacaras e Quintaes*, Vol. VI, No. 4, pp. 1-7. S. Pa Brazil, Oct. 15, 1912.

The coffee plant in Brazil is, at present, one of the least subject pests; nevertheless, it did not enjoy this total immunity in the past.

Thus from 1880 to 1890 *Heterodera radicolica* infested the roots the coffee plant in the State of Rio Janeiro to such an extent, that t crop in some cases was reduced by 95 per cent. The nematode afterwar disappeared suddenly. About the same time, there appeared in this Sta the "bicho do café" (the insect which the present article mentions : occurring in the State of São Paulo); its ravages were estimated by Del croix as affecting 35 per cent. of the crop, and by Van Delden Laerne: destroying the whole crop in some plantations. This dangerous parasit is a microlepidopter belonging to the family of the *Tineidae*, subfamili *Lyonebianae*.

It was observed for the first time in the Antilles by Perrotet an determined in 1848 by Guérin-Minerville, who named it *Elachista coffeella*. In 1861, Stainton placed it in the genus *Contostoma*. Lord Walsingham

Zool. Society, London, 1897, p. 141) recognized that this genus is 1 with *Leucoptera*.

the latter appellation had the priority, the writer gave the insect ne of *Leucoptera coffeella* Guérin. He mentions among related *L. scitella*, which does great injury in Europe to the leaves of pear, etc.

havoc is wrought by the larvae; these are scarcely visible to the ye, and they penetrate through the cuticle of the upper surface leaves and devour the parenchyma situated between the two of epidermis. The latter in the end separate from the parenchyma, ing somewhat prominent, and assume a brown or reddish hue, the name of "rust" given to the disease in the Antilles and that in spot" (*mancha de hierro*) by which it is known in Venezuela.

single leaf can support several larvae (as many as 25 have been d). The larvae remain in the leaf from 7 to 8 days, according to t (whose observations were made in the Antilles) and from 18 days, according to Pickmann Mann, who studied the larvae at ras, in the State of Rio Janeiro. The discrepancy in the data is ess due to the differences of the localities and the climate.

ie larvae escape from the leaf by making on the latter an aperture in size, most often upon the lower surface, where the cocoon is r attached. The chrysalis period lasts barely 6 days (only one ation has been made on this subject). There are several genera the year; these are most numerous in mild winters.

Leucoptera coffeella has a wide area of diffusion; in America, it is in the Antilles, in Venezuela and in Brazil (where it was probably ood from the Isle of Bourbon towards 1860); it also occurs, amongst places, in Madagascar, Réunion and Mauritius.

me observers believe that the insect is indigenous in Abyssinia, it lives on the wild coffee plant.

appears that *Coffea arabica* is alone attacked, *C. liberica* being ie. The amount of damage caused by this pest is very variable, sometimes very slight, when a few leaves are a little injured; at times much injury is done, and the plant is so much weakened by sap that one-fifth of the flowers fall off.

he present limitation of the injuries is probably attributable to tion of the parasites of *L. coffeella*, viz. *Eulophus cemiostomatis*, *cus letifer*, a species of *Apanteles*, and another, hitherto undeter- species of *Eulophus*. The writer has succeeded in breeding a parasitic chalcid.

ump traps are recommended as a means of control (for the moths cturnal); also the collection of all fallen leaves containing larvae, should be burnt, or at once buried; another measure is the rear- the natural parasites of the pest. This is effected in small breed- es provided with nets with meshes fine enough to prevent the of the parasite of the plant, while at the same time permitting

the passage of the parasite of the insect. The writer adopts latter method in the work he is carrying on.

In the appendix, there is a bibliography of 9 works.

87 - **The Occurrence of the Citrus Red Spider (*Tetranychus m. pidis* Riley) on Stone and Pomaceous Fruit Trees in Oregon**

EWING, H. E. in *Journal of Economic Entomology*, Vol. 5, No. 5, pp. 414-415. (N. H., October 1912.

In November 1911, while examining some leaves and twigs of trees at Corvallis, Oregon, for the common red spider (*Tetranychus r. L.*), the writer came across *Tetranychus mytilaspidis* Riley, the known red spider of citrus trees in Southern California. Since observation several records have been made of this species in Oregon.

In the paper under review the writer submits notes on its life and economy under the influences of its new host plants and new conditions, and presents in tabular form the records of the species in Oregon.

Here in the autumn eggs are deposited on the twigs. These hatch in the following April and the larvae feed upon the tender shoots. These mites continue to feed and reproduce from the time hatching until the end of the rainy season, but with very little result. It is during July that the adults become very active and the eggs found scattered about all over the leaves, the species becoming very injurious by sapping the juices from the leaves and causing the latter to become pale or spotted and to curl up around the edges.

As means of control summer sprays and, even better, some dormant spray to kill the eggs are advised.

Lime-sulphur is not a satisfactory winter spray for the eggs of this mite. It will not kill the embryos in the eggs at all, but will, however, kill some, and at times perhaps 60 or 70 per cent, of the mites after they have emerged.

88 - ***Earias chlorana*, a Parasite of *Salix viminalis* (1).**

FETTAUD, Y. Les Insectes de l'Osier: *Earias chlorana* Linn. — *Bulletin de la Société d'Etudes et de Vulgarisation de la Zoologie agricole*, Year II, No. 4, pp. 1-2. Bordeaux, 1912.

The osier is one of the most widely cultivated plants of southern France, especially in the Gironde and Corrèze.

* *Salix viminalis* Linn. ("Osier blanc," the basketmakers' osier) is the most common species in the osier beds of this district, and is consequently the most liable to fungus diseases, and to the attacks of parasitic insects. After the month of August, a rust of the genus *Melampsora* attacks nearly all the leaves.

(1) See No. 876, B. May 1912; No. 1702, B. Dec. 1912.

Amongst the insect enemies of the osier, the goat moth (*Cossus la Fabr.*) and *Sesia* sp., the Longicornia *Lamia textor* Linn., *culata* Linn. and *Aromia moscata* Linn., and especially the beetle *hynchus lapathi*, Linn. make galleries in the underground stems; the *Chrysomelina*, of which the writer has already made a careful bulletin de la Société de Zoologie agricole, Bordeaux, 1908 and 1909), *chlorana* Linn., *Sarothripa revayana* S. V., and many other destroy the portions above ground.

The two latter species devour the shoots, which leads to the suppression of the terminal buds, and causes the osiers to ramify and to be valueless to the basket maker.

The last-mentioned species is always much rarer than the first in the beds of south-west France. In this district, there are two genera, *Earias chlorana* annually. The first does havoc in May-June, the second in August-September and passes the winter in the chrysalis condition. The moths, which appear in May and in July, lay their eggs at the extremities of the osier shoots, one on each shoot.

The caterpillar makes a cigar-shaped sheath by rolling together the surrounding leaves of the terminal bud. It leaves untouched its shelter, and only devours the inner leaves.

The writer counted more than 50 per cent. of infected shoots in some osier beds. No remedial treatment can be practised with the view of destroying the ensheathed caterpillar; the best control method is the collection and destruction of the cigar-shaped sheaths. The use of insecticides in the form of sprays is less recommended, since the hatching period of the caterpillars of a single generation may extend over more than a month, which, in connection with the rapid renewal of the terminal leaves, would render the application of these remedies very difficult.

In order to obtain any result, the treatment would have to be repeated every ten days during the laying season; this was in fact done by the writer in his series of experiments. He states that he observed a sensible diminution of the damage after three applications of a simple cupric solution, and more so when he used a cupro-phenic, or cupro-nicotine solution. Better results were obtained by dipping the extremities of the shoots into the compound than by spraying them.

These treatments can only be carried out in the spring, as the osier shoots become too thick in August-September.

Cupric mixture sprays are very efficacious, not only in the case of the osier, but also in that of *Chrysomelina*, and rusts. It is possible after the first treatment to clear an osier bed of *Earias* by the repeated removal of the infested larvae, to guard against reinfection by the setting of lamp traps.

A bibliography of 11 publications is appended.

INJURIOUS VERTEBRATES.

89 - Crows and Rooks in Agriculture.

JABLONOWSKY, J (Director of the Budapest Entomological Station) A Varjak a das ághan. — *Kísérletügyi Közlemények*, Vol. XV, No. 3, pp. 466-508. Budapest, Sept. 1912.

This is a detailed study of the part played by crows and rooks in agriculture, according to publications printed in Hungary and elsewhere. The question is one of importance to practical agriculture everywhere where there are large numbers of rooks, and is one which affects the agriculturist, ornithologist and agricultural entomologist. Species of Crows, especially the rook (*Corvus frugilegus* L.), have partisans who regard them as actual allies of agriculture, but their detractors aver that they do more injury. The writer belongs to neither side.

In an earlier publication (*Kísérletügyi Közlemények*, Vol. IV, No. 2, 1911) and elsewhere, he discussed the data obtained out of Hungary. The present work is a critical study of data collected in Hungary itself. It shows that the supposed utility of the rook was based on false bird views and one-sided statistics. The writer states that the examination of the stomachs of rooks and of other insectivorous birds (killed thousands) do not furnish the expected proof of their utility, but on the contrary, that they have destroyed inoffensive birds. On these observations as a basis, M. Jablonowsky concludes that *C. frugilegus* L. should not be regarded as a wholly useful bird. In places where it builds its nests in large numbers, it is capable of causing considerable damage, which justifies its destruction. In comparison with the hawk, its utility is very slight. Where it is only a bird of passage, it is for the most part inoffensive.

90 - Birds and Rats injurious to Rice in the Philippines. — See also No. 27.

91 - The Cat Problem in Australia.

LE SOUEF, A. S. in *The Agricultural Gazette of New South Wales*, Vol. XXIII, pp. 895-896. Sydney, Oct. 1912.

The domestic cat of Australia has become wild and must be included in the list of the destructive animals of that country.

The cats which have become wild, are in some cases and which have been turned out into the bush by their owners, or have run away, or have been liberated by stock owners as a supposed enemy of the rabbit.

They have now become established throughout the land and are living on the wild game. They devour small animals, lizards, opossums

ven lambs, as well as rabbits. In the Macquarie Islands they very numerous and destructive to the sea-birds, which supply alers with eggs. It was therefore necessary to introduce dogs for uppression of the cats. When the latter were killed off, the dogs attacked the seals, and therefore had, in their turn, to be de-
ed. Where the wild cat has established itself, the ground game
mall marsupials have greatly diminished, and it seems that in the
the partial extermination of certain species can be counted¹ upon,
its influence on the rabbit question remains yet to be seen.
Wild cats have practically no enemies in Australia. They seem to
verting to a specialized type, that of a blotched tabby; in parts of
island, they are more or less striped and have a heavy ruff round
eck. In Lord Howe Island, they are very dark, mottled grey,
larger than the average house cat, specimens up to 20 lbs. in
t having been recorded.

